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THE ELECTRIC RAILWAY CONVENTION.

One of the most interesting and important conventions of the year is easily that of the electric railway industry, held by the American Street & Interurban Railway Association. This month the twenty-seventh annual convention, as duly noted in our pages, has been held at Atlantic City, with an attendance in excess of 3000. "Broadway-by-the-Sea" was never more attractive than last week, when brilliant sunshine and a full moon were ideally supplemented by coolness that allowed the wearing of an overcoat at night and warmth that permitted surf bathing daily. It is needless to say that under such conditions, the meeting went forward with the briskest snap and swing, and that the members were able to get the fullest measure of instruction and entertainment. There was little opportunity and little inclination for loafing. The Association now has five constituent parts, and on some days these were conducting seven meetings, making a pretty strenuous time of it; while that does not include the Manufacturers' Association, which gave a superb exhibit of apparatus and supplies on the "Million-Dollar Pier."

In fact there has been a tendency of late in one or two influential quarters to regard the Association program in its present make-up as rather cumbersome and unwieldy. This feeling was voiced by President Goodrich, of the parent body, who suggested the advisability of separate places and separate meetings for the parent Association and its various sub-organizations; so that there would not be such a congestion of work and so that fewer executive officers would be away from their posts at one time. Incidentally, the expense plays a part, for the cost, all told, of such a convention cannot be placed at less than $250,000. On the other hand, it stands to reason that the annual convention would no longer be the great event of the year that it now is; the annual show of new and improved apparatus would be likely to suffer; and there would be the difficulty of getting that joint action and that influence on public opinion which can certainly be wielded to advantage by a great gathering of earnest men all with a common object. The situation is not without interest to the officers of the National Electric Light Association, which in its magnitude and multiplicity of work is already developing along somewhat analogous lines to those followed by the street railway association, and is now trying other methods of growth and expansion.

The part of the work at Atlantic City of most importance to electrical engineers was necessarily that of the Engineering Association, which considered such questions as power generation, power distribution, economical maintenance, standardization, etc. To this section we have directed special attention in our report. There were other topics of more general interest, such as the conduct of a publicity department, and the education of employees, to the papers and discussions on which electrical readers may also well devote a little time.

Undeveloped Water Powers.

The article by Mr. Ball in the present issue cannot fail to impress the reader very forcibly with the unimproved opportunities that lie along every large stream. The biggest falls which are conspicuous at once have been in large measure taken up and turned to industrial account. It is the more modest ones, less imposing and hidden in comparatively unfrequented districts, that remain untouched. Yet some of them afford capital opportunities for cheap development and would give ample returns on the investment. Some day people will invest in a water power as they would in a mercantile concern, and not as they would take a flier in Arizona copper stocks. A water power economically developed and managed with ordinary business sagacity is better than a gold mine, for it pays regular returns and never peters out. The commonest trouble up to the present time has been that hydro-electric developments have been looked upon as things to be exploited—as rafts upon which to float securities, as valuable in proportion to the possible bond issue—as anything and everything except simple business propositions involving direct investments for certain and reasonably large profits. There are few such propositions that will not pay handsomely when built for cash and operated for profit; in other words, when organized for the sale of power instead of securities. The few conspicuous dead ones are the victims of exploitation thugs.

The Georgia powers described by Mr. Ball are exceptional neither in number nor character. All along the slopes of the Atlantic uplands there are scores of powers ranging in magnitude from a few hundred to a few thousand of horse-power ready to be put to use. Many regions show on an average higher heads than most of those here described. To bring these powers to market is most emphatically the business of local capital. Few of them are big enough to attract the bankers who expect to make their profits out of handling large blocks of securities. It is the local bankers who daily do business in the communities that would be directly benefited, on whom the duty of development devolves. The great value of these powers to the country at large lies not in their mere value as powers so much as in the possibilities they present for the healthy stimulation of local industries. The South has gained wonderfully in the last few years from this very cause, and as Mr. Ball's data show, the work of improvement has only half begun. And the best of it is that the South has gained not so much in the aggregation of population and capital in the larger cities as in the building up of town after town by factories small and large. A hamlet with cheap power soon grows to be a thriving village, and the more of these the better for the country. A stream giving but a few hundred horsepower if carefully developed can give employment to scores of men and make several comfortable fortunes. We wish that some one in every State would give as careful a summary of its hydraulic resources as has Mr. Ball, and particularly that the publication would stimulate the enterprising men in each locality to get together and see what can be done toward making these powers profitable. The Middle States and the New England States are rich in these smaller powers, some of them of unsuspected value. We could mention several important plants now under way as the result of a keen sight, ranging over territory not generally believed to present the best of opportunities. And there are plenty more to be found.

The Tertiary Transformer.

It is interesting to note the recent advent in several forms of special transformers for low-voltage metallic filament lamps located in the secondary side of the distribution system and furnishing a tertiary circuit for the lamp. These are, considering their very small size, of pretty good efficiency and put at one's disposal energy at 30 volts or less, according to construction. This device enables one to work tungsten lamps of as little as 5 cp to 10 cp while retaining a very short and strong filament. The actual loss in the transformers is claimed to be only a few watts, even as low as one or two watts, so that transformer and lamp together retain a very high efficiency. Transformers of this kind are already in some considerable use in England, where there is a special temptation to use them on account of the rather common distribution at 2 x 240 volts. The effect of the power factor of the system must obviously be bad if any considerable number of these tiny transformers are in circuit, and the central stations therefore look upon them with little favor. Yet they do good service for the consumer and make a brave showing of economy, at least until the maintenance and repairs begin to come in. Of course, such apparatus is new and no one can tell just what its upkeep will be. From the low voltage it should be rather free from trouble, but to be of any practical account it must be both small and cheap, which are distinctly adverse conditions. We fancy that it will not be exactly welcome to central stations. But there certainly are cases where it will prove convenient, if for only 10 hours' use.

The question of getting the new lamp for a 240-volt distribution, either two-wire or three-wire, is a rather troublesome one. Of course, there are tungsten lamps for such voltage, but the reports commonly received from them are not very encouraging, particularly as to moderate candle-powers. Abroad the 240-volt tantalum is rather given the preference at present. It is really two 120-volt strung spiders mounted in series in the same globe of about the usual size. As tantalum lamps are made freely in Germany for 110 to 120 volts, 16 cp, a 32-cp, 240-volt lamp is the usual thing. It would be interesting, by the way, to try the tertiary transformer on low-voltage tantalum lights to see if a stouter filament would obviate the faulting on alternating current. Aside from tantalum which is used, with some mental reservation, on alternating current circuits, the burden of modern lighting on these high-voltage distributions falls on the Nernst lamp, which is very well liked and has made a good record. Of course, carbon lamps are as yet in the majority everywhere, but as time goes on the question of tertiary transformers will be pertinent wherever alternating current is available. Broadly, any such device of relatively high cost for its output will not be widely used unless its use is unavoidable, and in this country, where the ordinary distibution has been at 110 volts, it seems likely that tertiary transformation will make slow headway. Nevertheless, there are places where it might be extremely convenient for the operation of small or special lamps. Anyhow, a transformer of such sort is a convenient thing to have in production for many purposes, and we trust it will find use enough to justify its being. Meanwhile the lamp makers are busy with new filaments, and while nothing definite has yet come into sight there is certainly good hope for a filament of higher specific resistance than either tantalum or tungsten and with equally good efficiency and life, whose coming will obviate the use of special transformers.

Color Analysis of Illuminants.

One of the most suggestive papers at the Philadelphia convention of the Illuminating Engineering Society was that by Dr. Ives on work with the colorimeter. The instrument is in effect a color mixing box with which a given source of light can be matched against a known mixture of supposedly primary red, green and blue. We say supposedly, since in this particular instrument the colors are derived from colored screens of which the red and blue are rather less pure than the green, and there is a chance that some of the apparent anomalies found in the results may be due to this cause. Color mixture for such purposes has generally been done with red, green and blue cut out of the prismatic spectrum, requiring rather unwieldy apparatus—a difficulty which the present instrument avoids. Unless a prismatic color box be of large dimensions there is danger that the selecting slits as they are opened may shift the mean wave length materially. In the colorimeter used by Dr. Ives this cannot occur, but one depends on the correctness of the mean wave length transmitted by the screens, which may be considerably modified by the varying physiological effects as the intensities vary. In other words, the sensibility of the eye for color in faint illumination enters as a disturbing factor since the extent of spectrum admitted by the screens is sufficient—especially at the two ends of the spectrum—to permit material shifts in the point of dominant physiological effect. There is also a chance that the blending device which depends on persistence of vision may produce some modifications.

We make these suggestions not in any spirit of criticism of what is really a most interesting piece of research, but because the outstanding differences in results obtained by the colorimeter by the prismatic color box are so important as to demand thorough investigation and explanation of methods. Dr. Ives obtains for a gas flame the following proportions: Red, 100; green, 40; blue, 5.8. Sir William Abney working with prismatic colors obtained for a gas flame: Red, 100; green, 95; blue, 27. In other cases the results are similarly divergent, Dr. Ives' figures being apparently very much lower in the green and blue than Sir William Abney's, in the terms in which the two sets are given. This difference in the figures is completely changed if one remembers that Dr. Ives' readings are given in an arbitrary scale of red, 100; green, 100; blue 100 instead of on Abney's percentage scale; but the data continue irreconcilable when due allowance is made for this. Part of the outstanding difference may be charged up to a difference in the conception of daylight, for which, whatever it may be, the colorimeter scales read: Red, 100; green, 100; blue, 100. One must therefore go very cautiously in comparing Dr. Ives' figures as they stand with those obtained by other experimenters and other methods, while barring the physiological difficulty of which we spoke, they may be fairly compared with each other. The case in which they are liable to come to grief is that in which the illuminant investigated lacks conspicuously one of the primary colors, but is strong in more or less adjacent radiations which the screen lets through.

Looking now at Dr. Ives' figures as given, and remembering that they show not absolute percentages but percentages of the component rays taken separately and referred to an arbitrary standard, one can derive from them much that is of value. The one fact that stands out most conspicuously is the similarity of all the simple incandescent bodies, including flames, until one comes down to the Hefner lamp. There are, however, some anomalies even in this list. Does Dr. Ives wish to be understood as holding that the tantalum lamp has selective radiation for the green as compared with the graphitized filament carbon lamp? Of course, tantalum doubtless may vary from black body radiation, but if it is thus selective the fact is certainly very curious. On the other hand, the ordinary Welsbach mantle, which is known to have strong selective radiation for the green, appears in the list as standing next to the electric arc and the Moore CO_2 tube in approximation to daylight, and, wonderful to relate, the mercury arc falls into line even ahead of the trio just named. Now we have had white defined successively as just the color of several recently exploited illuminants, but we were not aware that even the best friend of the mercury arc ever claimed it to be a good understudy for daylight. Is there not something radically wrong with a rating so at variance with what the eye sees? This question is no reflection on the general accuracy of the experimental work as such. It reaches further, even into the inquiry as to whether any color match against the primary colors can be made to give the visual value of the color unless in the case of non-selective radiation. And the answer to this must be broadly in the negative. Without going into fine distinctions, the color box color and the visual color can agree only when the colors that are transmitted by the three slits or screens are normal samples of the spectrum as a whole.

The eye integrates the spectrum as a whole according to its luminosity curve, while the color box attempts to integrate it by reference to the three primary sensibility curves. Within certain limits the two agree, while beyond these limits they apparently do not, as might indeed well be expected. The result is that a freakish spectrum may give a visual effect nearer to or further from white than the color box would indicate. Color-matching tests throw some light on the subject. Like color-box tests, they are fairest when the lights compared give ordinary spectra. In the case of discontinuous spectra the relative results depend on the colors chosen. It would not be a difficult matter to select dyes that would suit an illuminant of any given type and make it seem reasonably near to daylight in its effects. Thus it is only too plain that even the most carefully planned methods of estimating color values of illuminants are liable to give unreliable results when discontinuous or abnormal spectra are concerned. Perhaps the most sensitive test is to illuminate sheets of plain white cardboard by the lights to be compared. The eye is very keen to perceive small differences of tint, and one can say quite definitely whether one sheet is bluer or pinker or greener than another. It is the quantitative measurements that give trouble. And the chief difficulty after all is to settle on a normal white as a standard of reference. Dr. Ives shows in his paper the astonishing discrepancies in the color values of daylight or of sunlight. Until there is some agreement as to what shall be called white, there may well be trouble enough in defining the colors of artificial lights. What we here wish particularly to emphasize is that color-box tests, however carefully made, are not satisfactorily comparable with each other for various reasons, particularly the lack of a common standard; that they do not give satisfactory results with discontinuous or abnormal spectra; and that even color-matching tests are uncertain, unless one is sure that the colors do not favor one source above another.

Merciful Electrocution in Abattoirs.

The Department of Commerce and Labor has recently compiled and published in its daily consular reports data as to the slaughtering methods employed in foreign abattoirs. U. S. Consul Louis Goldschmidt, of Nantes, furnishes the following description of the experiments with electricity in the slaughtering operations that have been demonstrated at that French city: "Very satisfactory experiments in electrocution of animals for food consumption have been made within the past year by Dr. Stephane Leduc, of the Medical School of Nantes, and they undoubtedly demonstrated that animals can be electrocuted very easily and without causing pain. During the course of researches made by Dr. Leduc with a view of causing electric sleep, he discovered this new and rapid method of inflicting painless death, a method which is very simple and inexpensive. The apparatus necessary is simple and not very costly, and the current used does not require to be stronger than such as is used for lighting purposes of low voltage. This current, which is a direct one, is interrupted at frequent intervals per second, and these frequent interruptions are produced by a special apparatus designed by Dr. Leduc. If an animal is submitted to this current, and if functions of life, circulation, respiration, etc., are stopped, a perfect and general insensibility is produced, while none of the essential organs is injured. If the current is stopped before two minutes have elapsed, life is restored again, and the animal does not appear to have suffered from the experiment. An animal subjected to this current for more than two minutes dies without pain from asphyxia." The animal to be electrocuted is placed upon a platform insulated from the ground by glass or porcelain stands. One electrode is placed upon the forehead between the eyes, and the other is placed at the extremity of the spinal column, so as to concentrate the current through the brain and spinal marrow, the two places where the electrodes are applied having previously been shaved in order to secure a perfect contact. As soon as the current is established the animal falls senseless, and it is then bled. Owing to the great contraction of the muscles, the bleeding is very profuse, and consequently the meat is supposed to be of better quality.

Experience of N. Y., N. H. & H. R. R. with Single-Phase Railway System.

Mr. William S. Murray, electrical engineer of the New York, New Haven & Hartford Railroad Company, which has been operating the Westinghouse single-phase electric railway system on a part of its lines during the last two years, gives the following account in the Boston *News Bureau* of experience with the system:

"The most commercially valuable answer as to the success of electrification on the New Haven is written in the actual operating schedule in the electrification zone. The train delays suffered to-day by electrical operation are but a small percentage of those incurred during the period of steam operation.

"As the zone limits in our case were not a terminal proposition, the application of the direct current showed itself to be impracticable. On account of errors, always common in initiative work, the first few months' operation has been a period of interruption, which has naturally been annoying both to the road and the public. To-day the delays have disappeared by the removal of their cause.

"The wisdom of the purchase of a locomotive consisting of two individual half units, the whole or half unit being operative by a single crew, has proved itself in the ability of the road to handle 75 per cent of traffic with half-unit locomotives, using the whole unit on the remaining 25 per cent of trains, whose weight demands the full drawbar. Should future requirements see the advantage of extension of electrification east of Stamford, the system is designedly applicable.

"As to the saving in cost of operation, as compared with steam, I would state that operation to-day has not been of sufficient length of time to make this comparison. It may be interesting to note, however, that by exhaustive investigation I have found that 1 lb. of coal burned under the boilers of our central station produces twice the drawbar pull obtained by 1 lb. of coal burned in the fireboxes of the steam locomotive, or, in other words, the fuel bill for electric traction is one-half of that required for steam traction. Other economies will arrive in the low cost of maintenance and repairs of the electric locomotive as against steam locomotives.

"The density of traffic is, of course, the paramount feature as to the savings to be effected by electrification. It is not to be forgotten that, in electrifying, interest, depreciation, insurance and taxes follow closely on the heels of the capital investment in equipment and material necessary to electric operation. The heavier the traffic, the greater will be the economies derived from the two above-mentioned sources.

"It is quite conceivable that the heavy ton-mileage in freight and passenger service on the Atlantic Coast line roads will effect savings sufficient to cover the above-mentioned fixed charges on the investment necessary to their electrification.

"The greatest value to be experienced by electrification will be in the tremendously increased traffic capacity of the present track mileages, due to the facility electricity offers in making rapid main line and yard train movement, or, stated in another way, it is thus immediately seen that electrification will permit a tremendous increase of traffic without an increase of track mileage, and thus roads which are up against the requirement of handling their congested traffic by laying new tracks, which, of course, is a most expensive procedure, on account of right-of-way difficulties, will be led into providing an equal capacity by electrification of the old trackage."

Annual Meeting of the Boston Edison Company.

The annual meeting of the Edison Electric Illuminating Company of Boston was held on Oct. 13, and all the directors and officers were re-elected. President C. L. Edgar stated that the increase in business during the past year has been as great as during the preceding year which, up to that time, was by far the largest in the history of the company. Taking into consideration the business depression which has existed during the greater part of the year, this result is extremely satisfactory. The earnings show a somewhat smaller growth than during the three or four years preceding. The year's operations, however, have resulted in an increase in undivided profits of somewhat more than ½ per cent upon the capital stock. The new turbine station at South Boston has been completed, and a 12,000-kw turbine, referred to in the last report, is in operation. At present it does not seem probable that it will be necessary to install additional capacity during the current year. As the price of copper has dropped to its normal level during the year, the transmission lines between Woburn and Boston and Medfield and Boston are now under construction, and it is hoped to shut down the steam stations supplying these districts some time during the coming year. Upon completion of this work the current furnished by the company will be manufactured either at the Atlantic Avenue station (capacity 14,000 hp), or at the L Street plant, South Boston (capacity 68,000 hp). The lines of the company now extend over a district 40 miles long by 15 miles wide, including 32 municipalities. In two of these the distribution is owned by the municipalities themselves, and in three others it is owned by private companies operating therein but purchasing electricity from the Edison organization. Following is a comparative showing of lamps and motors connected:

	1908.	1907.	1906.
Incandescent lamps	938,670	863,313	788,560
Arc "	9,867	10,339	10,534
Motors, horse-power	39,422	35,095	30,432

The gross earnings for the year were $4,229,239, and the net earnings $2,006,336. The surplus for the year was $162,967.

Stanislaus Power Plant.

The hydro-electric plant of the Stanislaus Power Company, on the Stanislaus River, in Central California, is now approaching completion. The water is taken out at a diverting dam, carried by means of a flume for about 12 miles and a ditch for about a mile, when it empties into a forebay. From this it is

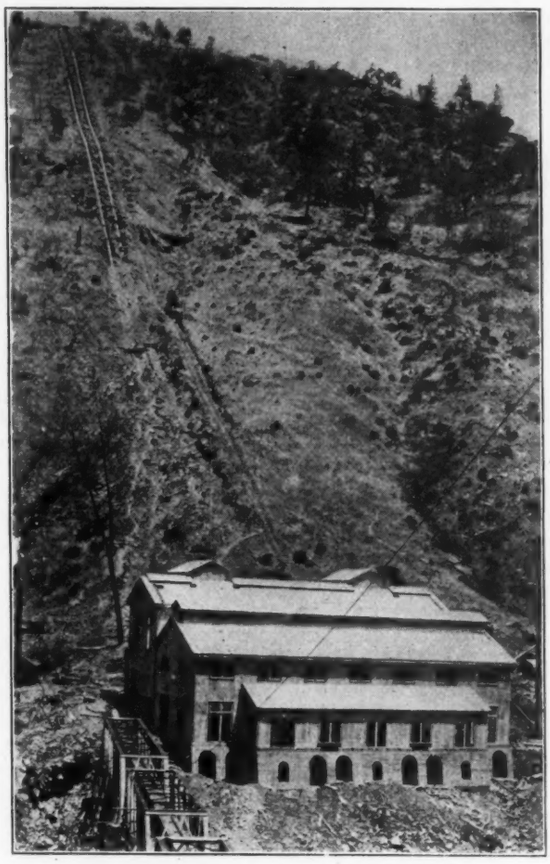


FIG. 1.—VIEW OF PIPE LINE AND POWER HOUSE.

carried through a short length of wooden stave pipe and then through a steel pressure pipe, 3500 ft. in length, to the power house, the total head being about 1500 ft. Another pipe is carried on beyond the power house, syphoned over two hills

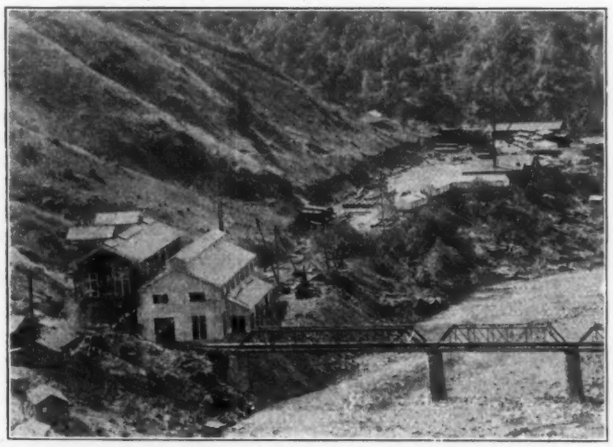


FIG. 2.—PIPE LINE OVER BRIDGE.

and carried to the San Domingo mine, as the power company has a contract to supply this mine with water.

The power house is situated about 15 miles from Angels, and is 6 miles from the south fork of the Stanislaus and 2 miles from the north fork. In the way of future developments, it is reported that, after this plant is completed, the company will build another one 12 miles above at the intake of the present plant. This second plant will utilize a head of about 2000 ft.

The location of the present plant is well illustrated in the accompanying views, which were taken during construction. In the small addition next the river will be installed the exciter units, in the middle building the main generating units and in the taller building at the rear the transformers, storage battery, pumps and air compressor, with high-tension switches and wires above. The equipment consists of three 6700-kw, 4000-volt generators, each machine being driven by two 5000-hp Pelton water wheels. For each unit there will be a bank of three 4000 to 114,000-volt transformers. There will be two exciter sets, each driven by an induction motor and water wheel, the motor acting as a governor when the wheel is the motive power.

The pole line, which is now being constructed, will be about 100 miles in length, reaching to San Francisco, and consists of steel towers carrying No. 00 cable. The wires are suspended by the new type of hanging insulators. The towers are 800 ft. apart on the level and closer together in the mountains. The wires are anchored at every eighth pole, using disk insulation, the anchors being brought back each way to the angle-iron cross arms.

Iron and Steel Electrical Engineers' Convention.

The Association of Iron and Steel Electrical Engineers held its second annual meeting at Chicago Oct. 14, 15 and 16. The meetings were held at the Western Society of Engineers, and most of the sessions were closed to those not members of the association. Among the principal subjects discussed were gas engines, steam turbines, centrifugal compressors and low-pressure steam turbines. An important feature of the program was a series of visits to the important steel works at South Chicago and Gary. The large gas-engine installations at Gary and at South Chicago were visited, as was also the Hawthorne plant of the Western Electric Company and the International Harvester Company's McCormick works, at both of which places a study was made of turbo-generators.

Among the papers and topics discussed were the following: "Standardizing of Electrical Apparatus"; "Electromagnets for Scrap Breaking," by Mr. G. W. Richardson; "Lifting Magnets," by Mr. C. Pirtle; "Electric Motor Driving," Mr. E. W. Yearsley; "Increase in Production by Machinery on Motor Driven Line Shafts," Mr. G. H. Winslow; "Mill Type Motors and Controllers of the General Electric Company," Messrs. Knight and Whiting, and "Low Pressure Steam Turbines and Centrifugal Compressors of the Same Make," by Messrs. C. J. Callan and Thomas Raddin; "Low Pressure Turbines—Westinghouse Machine Company," Mr. E. Yawger; "Power Transformers and Alternating Current Motors, Wagner Electric Company," by Mr. W. A. Layman; "Alternating and Direct Current Motors," by Mr. Gano S. Dunn; "Gas Engines and Turbo Generators, Allis-Chalmers Company," Mr. E. T. Adams, and a general talk on Westinghouse Electric apparatus. During the three days the members were guests at dinner of the General Electric Company at the Illinois Athletic Club; at the Auditorium Annex, of the Crocker-Wheeler Company, and at the "Tip Top," of the Westinghouse Electric & Manufacturing Company.

The retiring president is succeeded by Mr. J. C. Reed, electrical engineer, Pennsylvania Steel Company, Steelton, Pa., the past first vice-president; while Mr. G. M. Sturgess, electrical engineer of the Lackawanna Steel Company, of Buffalo, N. Y., the past second vice-president, was stepped up to the vacant office of Mr. Reed, and Mr. L. R. Palmer, electrical superintendent of Jones & Laughlin Steel Company, South Side Works, Pittsburg, became second vice-president. Mr. E. W. Yarsley, electrical engineer, Midvale Steel Company, Philadelphia, Pa., and Mr. G. H. Winslow, electrical engineer, National Tube Company, Frick Building Annex, Pittsburg, were both re-elected to the offices of treasurer and secretary, respectively.

Indirect Lighting at Chicago Illuminating Engineering Meeting.

The Chicago Section of the Illuminating Engineering Society held a meeting Oct. 15, at which a method of indirect lighting for residences, known as the "I-Comfort" system, was shown in practical use at the residence of Mr. A. D. Curtis. The paper of the evening on "Indirect Lighting" was prepared by Messrs. A. D. Curtis and A. J. Morgan. Eight rooms of Mr. Curtis' home were shown lighted by an indirect system which consists of a reflector of the "X-Ray" corrugated mirror type placed under a tungsten lamp or gas-mantle burner on a chandelier at the ordinary 6.5 ft. height in the center of the room. The reflectors were supported by neat brass spinnings of the same finish as the rest of the fixture. The light being thrown to the ceilings and upper sidewalls, the illumination of the room was accomplished mainly by reflection from the ceilings. It is, of course, essential that the ceiling be light in color. The system was shown in rooms with walls both dark and light In the smaller rooms, with light-colored walls, a 60-watt tungsten lamp was ample. In the larger rooms one or more 100-watt lamps were used per room. In two of the rooms which had dark green walls and which were large enough to accommodate the 75 persons who attended the meeting, one 100-watt lamp in each room proved sufficient during most of the time of the meeting. The authors briefly explained the system and apparatus used and gave a short account of the experimental work they had done. In the discussion which followed, the consensus of opinion seemed to be that the indirect lighting system as worked out in this case was practical for rooms with low and light ceilings such as prevail in residences, and that the indirect system is unquestionably more comfortable and better for the eyes than a direct system, if the indirect system is properly designed. The discussion was taken part in by Messrs. V. R. Lansingh, George Loring, Prof. Morgan Brooks, Dr. Henry Gradle and a number of others. The oculists who spoke were especially favorable to this plan of lighting. Mr. Lansingh said that from experience in the Harlem office of the New York Edison Company, a room with very highly-illuminated light-colored walls with indirect lighting was very trying on the eyes. Mr. J. R. Cravath pointed out that much of the trouble with indirect lighting systems in the past was due to poor and unscientific design and to difficulties of keeping lamps and reflectors clean. With the present system the design was such that most of the illumination came from the ceiling rather than from the sidewalls. This not only secured a higher efficiency of illumination than when much dependence was placed on the sidewalls, but also overcame the objection urged by Mr. Lansingh, of too much light from side walls. An interesting experiment made at the request of a member during the meeting was a brief trial of lighting the room by direct lighting. The reflector was simply lowered away from one of the lamps, allowing the light to shine in the eyes of the audience, but had to be replaced at once because of the discomfort caused by the direct light from the unshaded lamp as compared to the indirect lighting.

Meeting of the New York Section, I. E. S.

At the meeting of the New York Section of the Illuminating Engineering Society, held on Oct. 15, Mr. Norman Macbeth, as chairman of a special committee, reviewed the papers and discussions presented at the annual convention of the society held in Philadelphia. Abstracts of these papers were given in our issue for Oct. 10, and the discussions were outlined in the issue for Oct. 17.

In discussing the paper by Mr. F. E. Cady on "The Relation Between Candle-power and Voltage of Different Types of Incandescent Lamps," Mr. P. S. Millar stated that although the exponent for representing the relation is not a constant but varies with the specific consumption, yet the error occasioned by the use of a constant coefficient is practically negligible throughout the ordinary operating range of voltage. He stated that the discrepancies between actual facts and the calculations by the use of a constant exponent differ by not more than 1 per cent.

Mr. J. S. Codman questioned the practicability of the flux-of-light method of calculating illumination as treated in the paper by Messrs. J. R. Cravath and V. R. Lansingh. He called attention to the fact that in applying this method it is essential to employ a certain angle below which the lumens generated can be considered effective. This angle varies with the condition of application, and in ascertaining the value of this angle it is necessary to employ calculations other than flux-of-light methods, which calculations almost render the latter methods superfluous.

In connection with the paper by Dr. Herbert E. Ives, Mr. D. McF. Moore said that upon his request the inventor of the Ives colorimeter had recently compared the color of the light from a carbon dioxide tube directly with daylight, and had found the following relation: With daylight having 100 red, 100 green and 100 blue, the light of the carbon dioxide tube was found to have 100 red, 91.5 green and 67.8 blue. These values differ enormously from the values reported in the paper by Dr. Ives, who had given to the carbon dioxide tube values of 100 red, 120 green and 520 blue. Mr. Moore stated that on the day when the last tests were made the sky was blue. He expressed the opinion that if the daylight had been of average color the light from the tube would have differed therefrom by not more than 4 per cent. Mr. Herbert E. Ives, who had made both the last test and the earlier tests upon which the values in the paper had been based, said that the conditions under which the last test was made were much more favorable for obtaining accuracy than were those under which the earlier tests were made. The accuracy of the former tests depended upon the use of two intermediate lamps, an arc lamp and an incandescent lamp. The arc lamp was subjected to considerable variations in color, and doubtless the discrepancies were largely attributed to this fact.

Mr. J. S. Codman read before the New York Section a resolution which had been framed by officers of the various sections, suggesting a change in the constitution which would allow the section officers to be elected in June instead of January, in order that the work might be carried forward through each year without break, and be conducted more effectively.

Mr. P. S. Millar stated that definite arrangements have been made for meetings of the New York Section for the months of November, December and January. During November a visit will be made to the New York library described in the convention paper by Mr. L. B. Marks, where the author will explain in detail the various features of illumination. In December, Dr. C. P. Steinmetz will deliver a lecture on a subject not yet announced. In January the subject of street lighting will be discussed by Mr. W. C. Allen, electrical engineer of the District of Columbia, and Mr. C. S. Rhodes, of New York.

Electric Pump for Calumet Waterworks.

The waterworks which supplies Calumet, Mich., is located on the shore of Lake Superior several miles from town and 700 ft. below the level of the town. Waterworks pumping has been expensive because of the fact that coal had to be hauled by wagon from Calumet to the waterworks. Recently a 3,000,000-gal. centrifugal pump direct-connected to an electric motor has been installed. This will work against about 375 lb. per square inch. It will be supplied with power over a substantial high-tension transmission line from the Calumet & Hecla Mining Company's large electric power plant at Lake Linden, where coal is obtained directly from lake boats. The centrifugal pump is of I. P. Morris & Company manufacture. This will make two large electric waterworks pumping installations on Lake Superior, the 13,000,000-gal. electric pump for the Duluth waterworks having been described in the Electrical World of Oct. 10, 1908, page 796.

Conference on Electrical Units.

The International Conference on Electrical Units is now in session in London and will finish its labors the present week. Delegates from 18 countries are in attendance, the representatives from the United States being Dr. H. S. Carhart, of the University of Michigan; Dr. S. W. Stratton, director, and Dr. E. B. Rosa, physicist, of the Bureau of Standards. The delegates for Great Britain are Lord Rayleigh, president of the Royal Society; Prof. J. J. Thomson, Cambridge; Sir John Gavey; Dr. R. T. Glazebrook, director of the National Physical Laboratory; Major W. A. J. O'Meara, engineer-in-chief, General Post Office; Mr. A. P. Trotter, electrical adviser to the Board of Trade.

The main object of the conference is to obtain international agreement on the three electrical units—the ohm, the ampere and the volt—so that the realization of these units in all the countries of the world shall be, as nearly as possible, identical. The best method of setting up the mercury ohm, the silver voltameter and cadmium cell will be considered, with a view to formulating detailed specifications issued with the authority of the conference.

The delegates will be entertained at an official banquet and will lunch with the Lord Mayor; they will also make an excursion to Cambridge on the invitation of Trinity College and will pay a visit to the Cavendish Laboratory. The Board of Trade Government Standards Laboratory will be open to inspection by the delegates and the National Physical Laboratory at Teddington will be visited. The delegates will also dine at the Franco-British Exhibition with the "Dynamicables," and they are invited to the annual dinner of the Institution of Electrical Engineers.

American Electrochemical Society Meeting.

The fall meeting of the American Electrochemical Society will be held in New York City, Oct. 30 and 31. The headquarters will be at Hotel Cumberland, Broadway and Fifty-fourth Street. The program includes the following events:

Reading and discussion of papers at the Doremus lecture theater, College of the City of New York, Friday, Oct. 30, 9 a. m. and 2 p. m. On Oct. 31, 9 a. m., papers will be read and discussed at the Chemists' Club, 168 West Fifty-fifth Street. The social features include luncheon on Friday at the College of the City of New York and dinner at 7:30 p. m. at Reisenweber's, Fifty-eighth Street and Eighth Avenue. On Saturday luncheon will be served at Hotel Cumberland at 1 p. m., while a smoker will be held at the Chemists' Club at 8:30 p. m.

The following papers will be read:

"The Use of a Mercury Cathode in the Determination of Metals," by Messrs. A. Harold Porter and Francis C. Frary; "The Passivity of Nickel and Iron," by Prof. E. P. Schoch; "Equilibria in Standard Cells," by Dr. G. A. Hulett; "Chemical Energy," by Dr. J. E. Mills; "The Formation of Nitric Acid from Air by Means of Low-Voltage Direct Current," by Dr. G. W. Morden; "Electrolytic Corrosion of the Bottoms of Oil Tanks," by Mr. A. A. Knudson; "The Corrosion of Underground Structures," by Prof. Albert F. Ganz; "The Function of Oxygen in the Corrosion of Metals," by Dr. W. H. Walker; "The Theory of Electrolytic Paints," by Prof. W. D. Bancroft; "Simple Methods for the Prevention of Electrolytic Corrosion," by Mr. Maximilian Toch; "The Lash Steel Process and the Electric Furnace," by Mr. F. A. J. Fitzgerald; "Utilization of Power Stations for Electrochemical and Electrothermal Processes During Periods of Low Load," by Mr. E. A. Sperry; "Electrochemical Loads and the Central Station," by Mr. John Meyer; "Correct Methods of Measuring Stray Currents," by Dr. Clayton H. Sharp; "The Latent Heat of Vaporization of Zinc," by Mr. W. McA. Johnson; "Heat Losses of Furnaces Through Walls," by Mr. Carl Hering.

A special excursion has been arranged for Saturday afternoon, when a visit will be made to the Balbach Smelting & Refining Works, Newark, N. J., where the process of smelting and refining copper, lead, silver and gold will be shown.

American Street & Interurban Railway Association Officers.

At the convention of the American Street & Interurban Railway Association and its allied organizations, held at Atlantic City, N. J., last week, the following officers were elected:

AMERICAN STREET & INTERURBAN RAILWAY ASSOCIATION.

President, Mr. James F. Shaw, Boston; vice-presidents, Messrs. Arthur W. Brady, Anderson, Ind.; Thomas N. McCarter, Newark, N. J.; Gen. O. H. Harries, Washington, and Charles N. Black, San Francisco. Prof. B. V. Swenson, 33 West Thirty-ninth Street, New York, is secretary of the parent organization.

AMERICAN STREET & INTERURBAN RAILWAY ENGINEERING ASSOCIATION.

President, Mr. Paul Winsor, Boston, Mass.; vice-presidents, Messrs. F. H. Lincoln, Philadelphia; W. H. Evans, Buffalo;

JAMES F. SHAW, PRESIDENT AMERICAN STREET & INTERURBAN RAILWAY ASSOCIATION.

W. J. Harvie, Utica, N. Y.; secretary and treasurer, Mr. John W. Corning, Boston, Mass.

AMERICAN STREET & INTERURBAN RAILWAY TRANSPORTATION AND TRAFFIC ASSOCIATION.

President, Mr. C. Loomis Allen, Utica, N. Y.; vice-presidents, Messrs. R. I. Todd, Indianapolis, Ind.; George L. Radcliffe, Cleveland, Ohio; A. W. Warnock, Minneapolis, Minn.; secretary and treasurer, Mr. B. V. Swenson.

AMERICAN STREET & INTERURBAN RAILWAY ACCOUNTANTS' ASSOCIATION.

President, Mr. R. N. Wallis, Fitchburg, Mass.; secretary and treasurer, Mr. H. E. Weeks, Davenport, Iowa.

AMERICAN STREET & INTERURBAN RAILWAY CLAIM AGENTS' ASSOCIATION.

President, Mr. C. W. Hardin, St. Louis; vice-presidents, Messrs. E. C. Carpenter, Anderson, Ind.; Julius S. Harrison, Jacksonville, Fla.; Dr. F. J. Ryan, Syracuse, N. Y.; secretary and treasurer, Mr. D. B. Davis, Columbus, Ohio.

AMERICAN STREET & INTERURBAN RAILWAY MANUFACTURERS' ASSOCIATION.

The officers of this association are elected by the executive committee. The five new members elected on the executive committee to serve for three years are: Messrs. J. R. Ellicott, Pittsburg; C. C. Castle, New York; James H. McGraw, New York; W. K. Porter, Philadelphia; Cornell S. Hawley, New York. Mr. H. D. Hequembourg, New York, was elected to fill a vacant term of one year.

Convention of the American Street & Interurban Railway Association.

The convention of the American Street & Interurban Railway Association and its affiliated bodies at Atlantic City, N. J., Oct. 12 to 16, exceeded in point of interest any previous convention held by the association, while the attendance of delegates and guests was larger by some hundreds. The exhibits on the convention pier were presented on an exceptionally fine scale and covered every branch of electric railway operation. The entertainment features of the week and the list of officers elected by the various associations are given elsewhere.

Last week's issue contained a report of the opening sessions held on Monday and abstracts of some of the papers presented during the week. The American Street & Interurban Railway Association held its opening meeting on Tuesday afternoon in the Greek Temple. President Goodrich was unable to attend the convention owing to illness in his family and Vice-President Shaw acted in his stead. The report of the secretary and treasurer showed that the total number of active members in good standing is 262 and the total number of associate members in good standing is 249. The president's annual address contained suggestions as to the future policy of the associations in appointing separate times and places for holding the annual conventions of the affiliated associations; but it was decided to be inadvisable to take immediate action on the suggestions. At Wednesday's session the report of the committee on education was received and an address delivered by Mr. Caryl Ely. The constitution and by-laws of the Transportation & Traffic Association were approved at this meeting and a committee on resolutions was appointed. At the closing session on Thursday the reports of committees on insurance, welfare of employees, nominations and resolutions were received.

The Engineering Association also held its opening session on Tuesday, meeting in Aquarium Hall. The custom of arranging for a number of preliminary addresses from gentlemen connected with other associations was eliminated this year and in order that the association might also use the time to the best advantage the president, Mr. F. G. Simmons, made a very brief address, in which he referred to the work of the committees and touched upon proposed changes in the constitution. He also called attention to the fact that the greater part of the topics considered at the meetings represented the work of committees. The report of the executive committee outlined a method of appointing standing committees on standards, equipment, way, power generation and power distribution, whereby members will hereafter be appointed for three years in most of the committees with terms so arranged that the terms of one-third of the members of each committee will expire each year. The report of the committee on maintenance and inspection of electrical equipment dealt with motors and other parts of car equipment, together with specifications and rules for inspection. The report was the most voluminous of any made and is a compendium of present railway practice. Some points in this report and the discussions on them will be printed in a subsequent issue. On Wednesday the reports of the committees on standardization and on power generation were received. The program for the remaining days, as published in our issue of Oct. 10, was carried out without a hitch.

The Transportation & Traffic Association held its second session on Tuesday, at which time the report of the committee on training of employees and a paper on carrying of United States mail, its advantages and disadvantages, by Mr. C. H. Hile, were presented. Mr. Caryl Ely also made a congratulatory address. On Wednesday the report of the committee on freight and express, supplemented by a paper on progress by roads in carrying freight and express matter, was read. A number of papers on publicity were also read, but it was impossible to read and discuss all, so that some were left over for Thursday's session, at which time they were disposed of and the report of the committee on interurban rules was received. A paper on the operation of multiple car trains on interurban roads was presented by title and owing to the lateness of the hour discussion was passed. Similarly the report of the committees on passenger traffic and on rules for city operation were received and written discussions were asked for, to be presented at the next meeting. The meetings of the claim agents and of the accountants went off as scheduled.

Entertainment Features of the Street Railway Convention.

The entertainment committee of the American Street & Interurban Railway Association provided bountifully for the ladies, delegates and guests during the convention. Rolling chairs were furnished gratis to those wearing badges on their way to and from the convention pier and Bell telephones between every two adjacent booths gave free local service. The purely entertainment features were arranged so as not to encroach upon the functions of the convention. The annual reception took place on Tuesday evening in the Solarium of the Marlborough-Blenheim. An excellent musical program was provided.

On Wednesday the ladies were entertained at the County Club of Atlantic City. Sight-seeing automobiles were provided to convey the guests to and from the club. The entertainment included a ladies' clock golf contest, tennis, afternoon tea and music. On Wednesday evening the annual manufacturers' amateur vaudeville and theatrical performance was given in the Savoy Theater. On Thursday afternoon an entertainment was given for the ladies. The Marlborough-Blenheim Hotel was the scene of this entertainment consisting of musical readings by an accomplished artiste.

The regular theater parties organized by the entertainment committee were held on Thursday evening. Two theaters were hired for the affair, the Savoy and the Apollo. At the former a light, musical comedy, "Gay New York," was given and at the latter a drama, "The Call of the North," was played by a well-known star.

To the regular official entertainment were added various auxiliary dinners, notable among which were the "Get Together" luncheon of the Accountants' Association on Wednesday at the Marlborough-Blenheim, the smoker of the Claim Agents' Association at the Atlantic City Yacht Club House on Tuesday evening, the annual dinner of the Southern railway and supply men at the Marlborough-Blenheim on Tuesday evening and the after-theater supper party given by Mr. D. M. Brady at the Windsor on Wednesday night in honor of Mr. J. F. Shaw and friends.

Practical Power-House Operation.

Three questions forming part of the Question Box read before the American Street & Interurban Railway Engineering Association at its 1908 convention show the diversity of opinion that exists among operating engineers upon some very practical problems encountered in modern generating and distribution systems. Upon the question of whether the star or the delta interconnection of transformers were preferable, the answers are about evenly divided. Mr. M. V. Ayers does not believe the star method of transmission is ever to be preferred to the delta, except where the line voltage is so high that it is desirable to keep down the voltage on the transformer coils by this means. The star connection with grounded neutral prevents so high a rise of potential on insulators and lighting arresters as may occur with the delta system of connections, but also involves a shut-down from the grounding of one line which does not necessarily occur with the delta system.

For moderate voltages Mr. Ayers prefers the delta system.

Prof. Shaad said that the star connection of the high-tension windings of transformers for transmission purposes is preferred when it is desired to operate with the neutral grounded, and for high-potential systems where the cost of the transformer construction is reduced by the lower coil potentials required for the star connection. Mr. J. H. Hanna said that

the advantage of the star method of transmission is that it allows the possibility of a grounded neutral. Mr. William Roberts claimed that the star connection should be used for transmission to great distances for low current strength and "high pressure on the mains," and Mr. William A. House prefers the star connection when the voltage employed is about 6600 and when the distances are great.

Another question upon which opinions were not unanimous was whether to use step-up transformers for voltages as high as 20,000 or to depend upon a generator for current at that tension. Prof. Dugald C. Jackson said that in his opinion it is not desirable to depend upon generators for voltages as high as 20,000, except possibly where the generators are very large and are under special conditions of attendance. For ordinary circumstances it is preferable, he said, to depend on transformers for stepping up the voltage from that given by a generator, say 2200, to the higher voltage. Mr. P. P. Crafts said that the experience of his company with high-potential generators in small sizes has been very disastrous. While it is practical to generate as high as 11,000 volts, he believed in stepping up to the higher potential. Messrs. C. D. Emmons, William Roberts and B. Penoyer expressed themselves in favor of transformers.

Mr. M. V. Ayers said that if it is possible to design the generator to develop the required line voltage, this should be done rather than use transformers. He believes this should be done for much higher voltages than customary. The limit should be at least as high as 20,000 volts instead of 13,200 volts, the commercial limit up to the present time. The slight loss of efficiency in higher voltage generators should be less than the loss due to transformers. The cost should also be less, and he said he did not think that the greater risk of injury to the generator from lightning is sufficient to offset the considerations mentioned. Prof. George C. Shaad said that except in special cases where the transformers are desired as a protection to the generator against injury from line disturbances, it seems desirable to use a generator constructed for the line voltages up to potentials in the neighborhood of 11,000 volts or a trifle higher. For much higher potentials it is the usual practice to use step-up transformers, the generator potential being 2300 volts or higher. Mr. William A. House would depend on the generator for voltages as high as 13,200 and use step-up transformers for potentials higher than that.

Thirteen answers are given to the question, "Is it good practice to depend on car circuit-breakers, doing away wholly with the fuse?" and of these, seven are in the affirmative. The opinion expressed by these is that good circuit-breakers properly inspected should give satisfactory service and that both circuit-breakers and fuses are unnecessary. The others felt that inasmuch as circuit-breakers are apt to stick, the fuse should also be used as an extra precaution.

Water Power Development at Great Falls, Mont.

Plans are being perfected by Charles T. Main, engineer, Boston, Mass., for the immediate development of two powers near Great Falls, Mont. The upper development is to be made at the falls known as Coulter's, Crooked and Rainbow, situated about three miles down the river from Great Falls. At this point the head will be about 105 ft. high. A crib dam about 25 ft. high will be built, with masonry head gate, and waste-gate structures. A steel penstock 22 ft. in diameter and about 2500 ft. long will extend from the intake to the power house. The latter will be of masonry construction, containing about 30,000 hp of wheels and electrical apparatus.

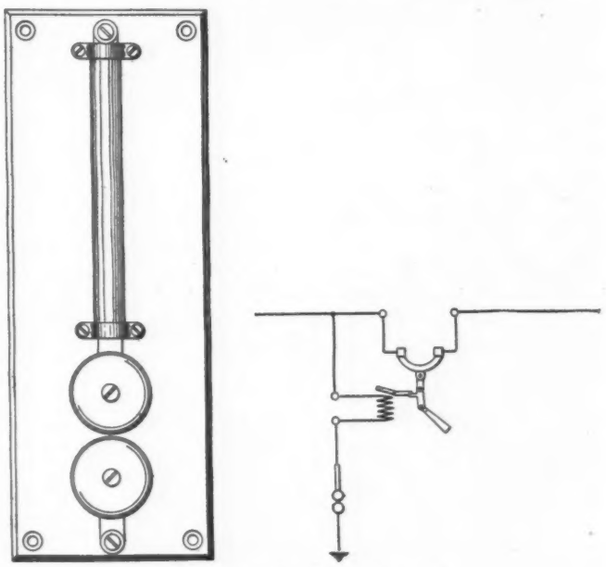
The lower development is about 12 miles below Great Falls. Here the fall is about the same as at the upper development. The dam will be of the same construction as at Rainbow Falls, the canal being 500 ft. long, and directly below this the power house. The equipment will be a duplication of that at the upper development.

The engineering corps already organized by Mr. Main is now busily engaged in making surveys and in the preparation of plans. The work on the coffer dams is already begun and it is expected to push the work of development to completion as fast as possible.

A considerable portion of the power developed will be used at the Boston & Montana Smelter, at Great Falls, Mont. The balance will be transmitted to more distant places.

Lightning Arrester.

A patent was issued Sept. 1 to Dr. C. P. Steinmetz on a lightning arrester having in circuit an oxide, such as magnetite, the resistance of which will become less and less as current continues to flow through it, so that if a ground continues too long, the line will be short-circuited. In series with this is employed an electromagnetic circuit-breaker which will open the circuit when the current exceeds a fixed value. A lightning arrester is used of a type which, as now manufactured, includes a current-resisting element consisting of a stick of graphite mixed with clay. For this stick is substituted another made of a pyro-electrolytic substance, such as magnetite or a mixture of magnetite and chromite of iron, or a stick of anthracite coal cut from a solid block. Such substances have a high specific resistance at ordinary temperatures, but when heated by the passage of an electric current they become increasingly conductive.



STEINMETZ LIGHTNING ARRESTER.

If it is desired to short-circuit the line in case the ground continues too long, the stick may be made of such proportions that it will become very hot, and as the conductivity of the magnetite at red heat is about 100 times what it is at ordinary temperatures, it will be seen that the device will prove to be a most efficient short-circuiting apparatus. When this action is not desired, however, the stick is made so long and with such heat-radiating capacity in proportion to its resistance, that in normal operations it does not reach the point at which it becomes highly conductive.

Should it be desired to open-circuit the line in case the ground continues for any length of time, an electromagnetic circuit-breaker of any well-known type may be combined with the lightning arrester, with the tripping coil in series therewith. When the current flowing through the lightning arrester reaches a certain predetermined value, the circuit-breaker will automatically operate to open-circuit the line. This allows the line to continue in operation for a short time on any ordinary ground, but protects the line if the ground continues beyond a reasonable point.

CURRENT NEWS AND NOTES.

CHICAGO ELECTRIC CLUB MEETING.—At the meeting of the Chicago Electric Club Oct. 14, Mr. W. J. Warder, Jr., read a short paper on "Direct-Current Elevator Motors," upon which subject Mr. Warder recently addressed the Association of Motor Manufacturers.

NINE HUNDRED THOUSAND PATENTS.—The nine hundredth thousand U. S. patent was issued on Oct. 3, and related to improvements in traveling stairs. Patent Commissioner Moore estimates that the one millionth patent will be issued in 1911. It is stated that a total of 1,135,000 patents have been issued abroad, but of course the figures involve many duplications.

ELECTRICAL SHOW SMOKER.—A pleasant feature of the New York Electrical Show was an entertainment and smoker given by the New York Edison Company to the electrical contractors of New York City in the concert hall of the Madison Square Garden on Tuesday evening, Oct. 13. An excellent vaudeville performance was provided, followed by a supper served in the banquet hall adjoining.

PYROMETER TESTING AND HEAT MEASUREMENTS.—The National Bureau of Standards has issued a third edition of a circular containing regulations for the testing of pyrometers of all kinds, and for various heat tests, including the determination of the heat values of coal. A table of fees is appended. Considerable information is included as to the principles and use of various types of pyrometers.

CENTRAL LIGHTING PLANT FOR YALE UNIVERSITY.—About $50,000 will shortly be expended by Yale University for the initial capacity of a central lighting plant, whose ultimate function will be to supply electricity to all the college buildings and dormitories not already provided with individual plants. The plant of the Yale dining hall and the Sheffield Scientific School will be remodeled for this purpose.

DANGEROUS AMUSEMENT.—Four young electrical engineers of rich families and graduates of the technical schools, have been arrested in Paris because they amused themselves making counterfeit 10-cent pieces—apparently electrotypes. The courts are puzzled to know what to do with these students, who did not attempt to pass the coins, and assert that they made them merely to amuse themselves. The laws are vague as to what should be done in such a case.

ILLINOIS CENTRAL ELECTRIFICATION.—Mr. Louis Fritch, assistant to President Hanrahan of the Illinois Central Railroad, who was recently in New York inspecting the electrical terminal system of the New York Central and the Hartford & New Haven roads, is reported to have said upon his return to Chicago that the electrification of the Illinois Central is impracticable unless other Chicago lines are converted from steam to electric power at the same time.

PUBLIC UTILITY COMMISSION FOR INDIANA.—At a recent convention of the Indiana Manufacturers' and Shippers' Association at Indianapolis, Ind., a resolution was passed declaring for a law creating a public utilities commission, patterned after the New York law. The measure, if it becomes a law, will provide for State control of railroads, including electric lines, also express companies, telephone companies and corporations furnishing water, gas, heat, power and electricity.

KANSAS ELECTRICAL ASSOCIATION.—The eleventh annual meeting of the Kansas Gas, Water, Electric Light & Street Railway Association was held in Pittsburgh, Kan., on Oct. 8, with President C. L. Brown, of Abilene, in the chair. Twenty-one new members were elected, and Wichita, Kan., named as the next meeting place. The following officers were elected for the ensuing year: President, Mr. W. A. Scothorn, Hutchinson; secretary and treasurer, Mr. James D. Nicholson (re-elected), Newton, Kan.

CHICAGO BRANCH, N. E. L. A.—The Commonwealth Edison Company, Chicago, starts out its branch of the National Electric Light Association with an enrollment of 356 members. The size of this enrollment is naturally a matter of considerable gratification to those connected with the company. The officers of the branch are George Harvey Jones, chairman; J. T. Mountain, vice-chairman; William Halloway, treasurer; L. E. Marshall, secretary. Executive committee, E. O. Schweitzer, Thomas Walsh and H. E. Addenbrooke.

AMERICAN GAS INSTITUTE.—The third annual meeting of the American Gas Institute will be held in New York City, Oct. 21-23, at the auditorium of the United Engineering Societies Building. The annual banquet will be given at the Hotel Astor on Oct. 23. A full program of papers is presented, with several interesting reports, including one on electrolysis by Mr. A. G. Glasgow, of London, England, and one on uniform accounting by Mr. R. A. Carter, of New York. Visits will be made to the large gas plants in the vicinity of New York.

LIGHTING RELICS.—With regard to the very interesting and valuable collection of early electric lighting material brought together for the recent commemorative electrical show, Mr. A. A. Pope, chairman of the historical lighting committee, is making an effort to keep the collection intact, with the idea of placing it in the permanent keeping of the American Institute of Electrical Engineers. It would, indeed, be a pity to see it disintegrated, and we are glad to learn that several of the exhibitors who loaned objects are willing that the plan shall be carried out with their generous co-operation.

ELECTRICITY IN BELGIUM.—In reply to inquiries, United States Consul-General Ethelbert Watts furnishes the following information concerning the electrical concerns in the Brussels district: "There are several underground tramways in Brussels, worked by two different companies, which employ their own staffs for the laying of the lines. Work for laying the underground telephone lines is done on the contract system. Underground lines are gradually replacing the suspended lines. A concession for electrical tramways has just been granted in Namur. Electric light and power plants are extending in the Brussels consular district. Projects are made to build plants in Anderlecht, Etterbeek, Auvelais, Montaigu, etc. There are 39 plants in Belgium manufacturing electrical machinery, supplies, etc., in which about 5900 workmen are employed."

ELECTRIC POSTAL TUBES.—It is stated from Milan, Italy, that the city and postal authorities are much interested in the project of Signor Giacchetti, of Ancona, for a very rapid transport of postal matter. With this system the postal service would be independent of the railways. He proposes to construct a subterranean tube in protected cement, in which small electric trains, with an engine and two or three postal wagons, would run at a velocity of 150 kilometers an hour. Two persons only, according to the Giacchetti plan, would be required for each train. The wheels would have tires of a special system of leather running on two cement rails. The motor engine would be on four wheels and have a length of less than 6½ ft. and a height of 5 ft., so that two men could comfortably sit in it. The tube would have all the necessary ventilation, and the telephone and telegraph wires might be laid in it also. Such a train could carry immense weights of postal matter, while distance would be practically annihilated. The inventor has calculated that a line between Milan and Genoa, a distance of 160 kilometers, with a tunnel under the Apennines, would cost $1,177,000, which is expensive; but he has also calculated that while this same service now costs the Government $156,800 annually, his system could be run for $18,000. Similar systems have been proposed in the U. S.

Electric Light Stations of the Eastern Pennsylvania Railways Company.

THE Eastern Pennsylvania Railways Company was formed in June, 1906, and controls the following companies in and adjacent to Schuylkill County, Pa.: Pottsville Union Traction Company, Pottsville & Reading Railway Company, Schuylkill Haven & Orwigsburg Street Railway Company, Schuylkill Electric Railway Company, Coal Castle Electric Railway Company, Port Carbon & Middleport Electric Railway Company, Tamaqua & Pottsville Electric Railroad Company, Edison Electric Illuminating Company of Pottsville, Anthracite Electric Light & Power Company of Pottsville, the Minersville Electric Light Company, Citizens' Gas Company of Minersville, Pa., the Minersville Fuel Gas Company, Frackville & Gilberton Light, Heat & Power Company, Edison Electric Illuminating Company of Tamaqua, Citizens' Gas Light Company of Tamaqua and the Tumbling Run Park Association. These companies supply practically all of the electric railway and lighting service in the valleys north and south of Pottsville, which include the richest anthracite coal region in the State of Pennsylvania.

The electric lighting companies included in the district are the outgrowth of old Edison companies. Some of them, especially that at Tamaqua, were among the first electric light companies to build stations, and consequently the energy was distributed on a three-wire system. This sufficed for the center of the town and as the towns grew in population and the outskirts became inhabited the service became poor on account of low voltage, and in several cases alternating-current apparatus was installed to carry the load of outlying districts. As a consequence a very mixed system with six separately-operated stations having an aggregate output of 5100 kw fell to the lot of the new company.

With the consolidation of interests in one management came also the reconstruction of the properties, so that at present there are but two generating stations instead of six, and the aggregate output of the two stations is 6500 kw. The various cities and towns are supplied with electrical energy directly from the generating station or through substations. The main generating station of the company is located at Palo Alto, southeast of Pottsville. The other generating station is located at Frackville, where the old station of the Frackville & Gilberton Light, Heat & Power Company is still being operated. It is expected that eventually, when the line from Port Carbon to Shenandoah is completed, this station will be converted into a substation and receive energy from Palo Alto.

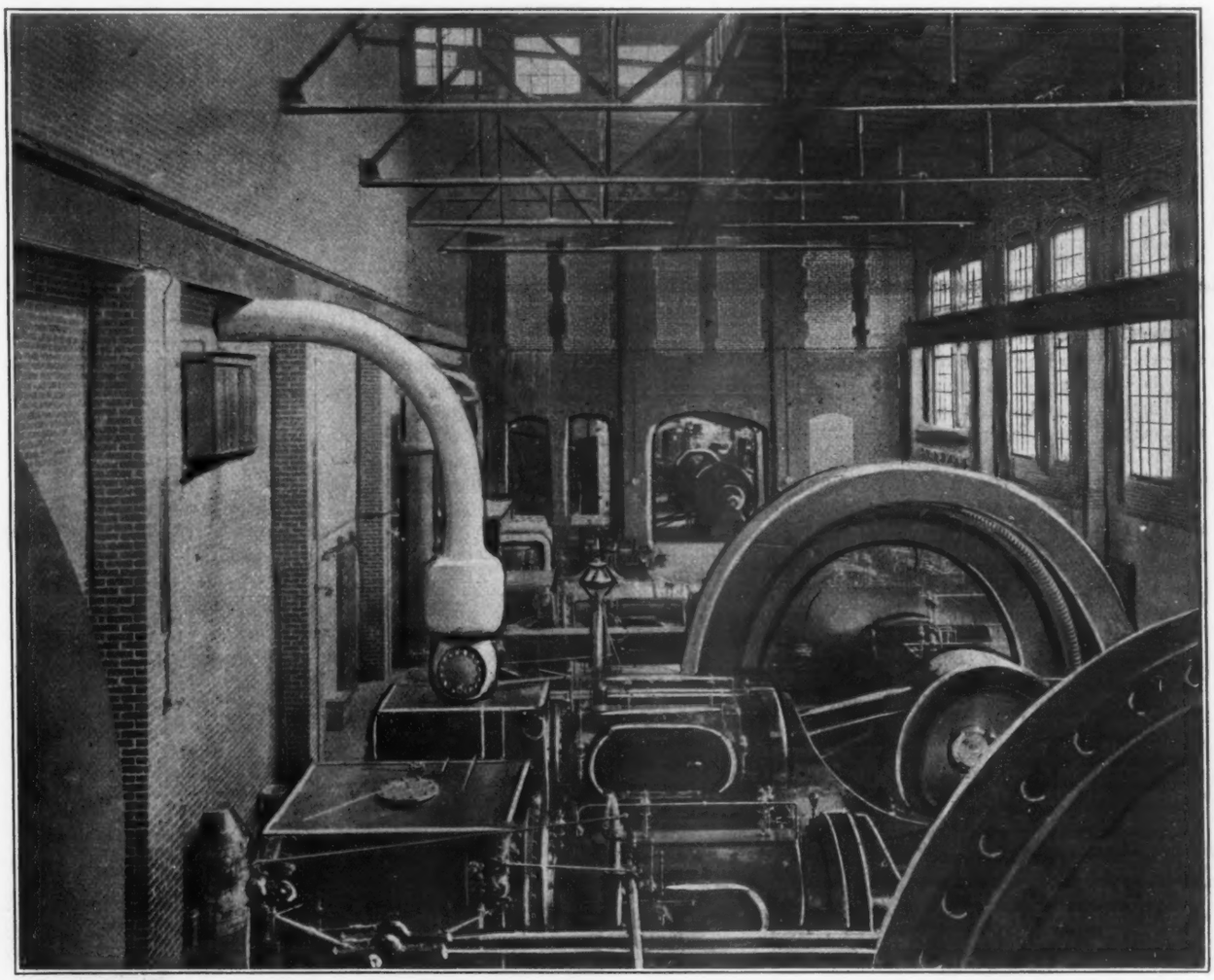


FIG. I.—INTERIOR OF MAIN GENERATING STATION AT PALO ALTO.

The cities and towns at present lighted from the Palo Alto station are Pottsville, Tamaqua, Port Carbon, Palo Alto, Minersville, Tumbling Run Park, Yorkville, Mt. Carbon and Orwigsburg. There are substations at Pottsville, Tamaqua and Orwigsburg. A separate company, the North Manheim Light, Heat & Power Company, owns the transmission line crossing the mountain to Orwigsburg and lights also Tumbling Run Park. Gilberton and Frackville, located in the upper valley and on the top of the mountain, respectively, are lighted with energy from the station at Frackville. The population in both places is composed chiefly of miners and the population served aggregates 12,000. Minersville is situated northwest of Pottsville and is reached by the Philadelphia & Reading Railroad and the Pottsville Union Traction Company's line. The town has

a population of approximately 6000 and is located in a territory rich in coal but not yet fully developed. Pottsville, the county seat, is located in the center of the lower valley and has a population of about 22,000, which is rapidly increasing. It is a thriving city, with excellent railroad connections. Tamaqua is located at the eastern end of the lower valley and has a population of about 8500. It has good railroad connections and is in the center of a good mining district. Besides the Eastern Pennsylvania Railways Company, the Tamaqua Light, Heat & Power Company operates a station and controls the public lighting in Tamaqua. This is the only opposition the company has in its territory.

The main generating station at Palo Alto contains two 1500-hp, cross-compound, Wetherill engines, direct-connected to two 1000-kw, 2300-volt, three-phase, 60-cycle Bullock alternators. The engines operate non-condensing under a steam pressure of 150 lb. In addition there are three 375-kw, 550-volt, direct-current, Walker generators, rope-driven from 500-hp, non-condensing Frick engines. These units feed into a separate switchboard connected in parallel with the main switchboard. Should separate operation be advisable at any time, double-throw switches are provided for that purpose. The units, however, are held in reserve for emergency use and also to carry any excess load. The railway load is ordinarily carried by an induction motor-generator set and a synchronous motor-generator set. These are of Bullock make and are rated at 400 kw each. Two main exciters are provided—one Harrisburg-Bullock steam-driven set rated at 125 volts and 600 amp, and the other an induction motor-generator set rated at 125 volts and 640 amp.

In the boiler room supplying the rope-driven sets with steam, and which is ordinarily held in reserve, are six Wood water-tube boilers, having an aggregate rating of 1050 hp. These are hand fired and are connected to the new boilers through a reducing valve, the pressure of the old boilers being 100 lb. In this boiler room is a water tank holding 45,000 gal., which is kept as a reserve water supply, feed-water being ordinarily taken from the city mains. Low-grade rice fuel, costing about 90 cents per ton on cars, is burned on solid grates and steam blowers are used to create a draft and break up clinker. In the new boiler room there are six boilers set in three batteries. These are of Stirling make, fitted with Dutch ovens and Ellis shaking grates. They are rated at 350 hp each and a 10-ft. fan supplemented with steam jets is used for forcing the draft. In this boiler room a 15-hp motor-driven elevator takes the coal from a pocket under the car tracks and delivers it into bins. From these the coal slides through ports to the boiler room. Although fuel is cheap, steam power is comparatively expensive owing to the dearth of water for boiler feed and condenser purposes. All the available water is controlled by the water companies and the railroad companies whose lines cover this rich coal territory. What little water is obtainable by driven wells is filled with sulphur and impurities. The cost of coal per kw-hour developed is approximately $.0037, and the cost of water when running non-condensing is $.0006 per kw-hour developed. The two Fairbanks-Morse feed-water pumps shown in Fig. 3 feed through a Cochrane feed-water heater.

The switchboard is of standard type for controlling railway, lighting and high-tension circuits. There are two high-tension circuits leading from the station. The 2300-volt cables from the switchboard lead to two sets of step-up transformers connected in delta and delivering current at a tension of 25,000 volts. The step-up transformers are located at one end of the station and in a room immediately above are the multi-gap lightning arresters and motor-driven oil switches for the outgoing lines. Both of the 25,000-volt lines run to Tamaqua on a single pole line. The lines are ordinarily operated independently, one feeding the lighting load and the other the railway load. It is possible, however, to operate them in parallel on both high-tension and low-tension sides; but for the sake of better regulation independent operation obtains. From the Palo Alto station a 2300-volt line runs to Orwigsburg, another to Pottsville and a third to Minersville through the Pottsville substation.

The Pottsville substation contains the following equipment: Three 300-kw synchronous motor-generator sets, made up of 2300-volt three-phase synchronous motors connected to 250-volt three-wire generators, the output from which is used for the direct-current section of the city, which extends about ¾ mile from the substation. There are also four tub transformers for street lighting circuits, and one spare unit for emergencies.

The switchboard comprises four direct-current distribution

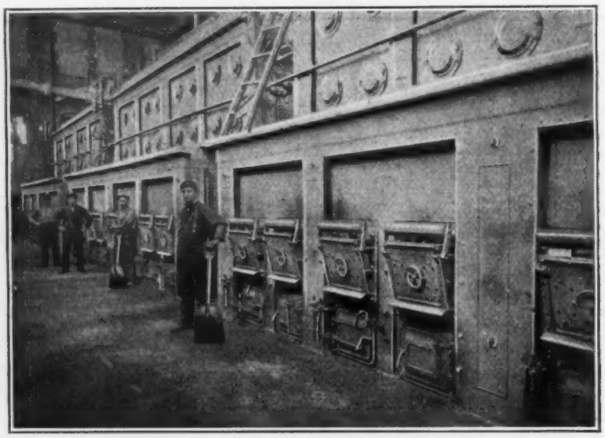


FIG. 2.—NEW BOILER ROOM IN PALO ALTO STATION.

panels, four magnetite arc panels and nine alternating-current panels. The latter consist of incoming, machine and outgoing circuit panels. The circuit to Minersville which passes through the Pottsville substation is controlled by an oil-immersed feeder potential regulator.

The total connected load on the direct-current circuits in Pottsville is approximately 1150 kw and on the alternating-current circuits 340 kw. The latter load is fed from distribution pole transformers entirely. There are approximately 800 customers connected to the company's lines, all of whom use lamps and about 90 of whom have motors. The rating of the

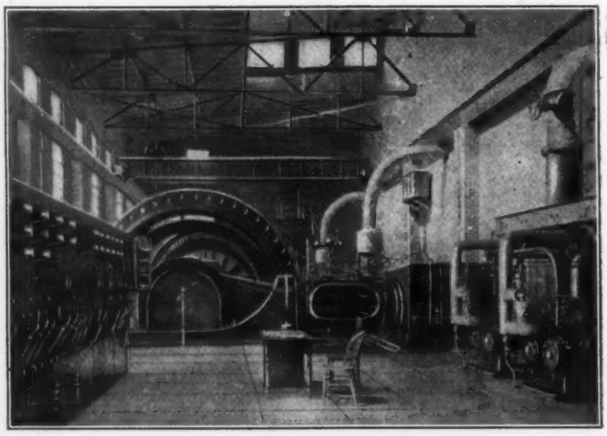


FIG. 3.—VIEW OF ENGINE ROOM, SHOWING PUMPS.

motors is about 400 kw. The streets are lighted by 192 magnetite arc lamps and 74 incandescent lamps rated at 32 cp. The number of enclosed commercial arc lamps in circuit is 338, and there are two commercial magnetite arcs also on the lines. The maximum load occurs in December, that for last December being 180,333 kw-hours. The base rate for energy is 10 cents per kw-hour, subject to a discount of 5 per cent for prompt payment and a further discount based on a curve of demand.

The substation at Tamaqua supplies 586 customers with electricity, 34 of whom also have motors. The total connected load is approximately 850 kw. The substation houses the following apparatus: One 450-hp induction motor-generator set for railway circuits; two 290-hp synchronous motor-generator sets for three-wire lighting circuits; nine transformers, which step-

down the voltage from 23,500 to 2300, with a spare transformer and a 30-kw tub transformer for the magnetite arc circuit. The arrangement of the apparatus is shown in Fig. 5. The lower switchboard is made up of 10 panels and the switchboard at the side contains seven panels—four for direct-current circuits and three for railway circuits. The high-tension line from Palo Alto is mounted on steel poles where it crosses the tracks

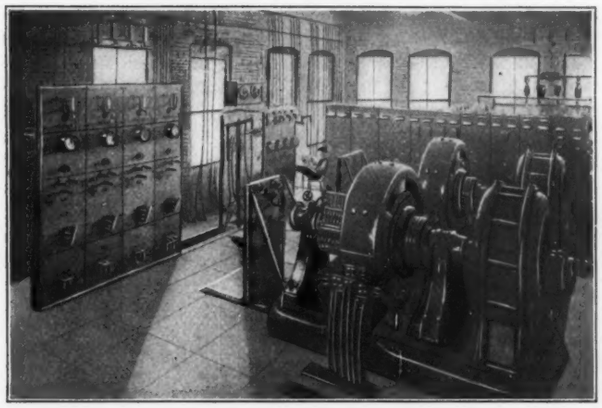


FIG. 4.—INTERIOR OF POTTSVILLE SUBSTATION.

of the Philadelphia & Reading Railroad in Tamaqua. A view of this pole line is given in Fig. 6.

The substation at Orwigsburg was started about a year ago and is located in a small frame structure on an alley near the center of the town. The residence load is carried by small pole transformers, which tap the 2300-volt line from Palo Alto. The apparatus in the substation, which is in operation only at night, consists of a magnetite arc outfit. At present there are 10 magnetite arc lamps in circuit for public street lighting and 24 incandescent lamps. The town has a population of about 1000 and the company has less than 50 customers. There are approximately 600 incandescent lamps fed from the alternating-current pole circuits. The total connected load is about 50 kw.

The Frackville generating station contains two 150-kw, 2300-volt, three-phase, 60-cycle generators, belted to a shaft driven through a clutch by a 175-hp Ideal engine and by belt by a 350-hp Frick engine. The company has about 360 customers connected to its lines, all of whom use lamps, there being no motor load to speak of. The streets are lighted by 66 magnetite arc lamps and there are 30 enclosed arc lamps on commercial circuits. The total connected load is 250 kw.

Minersville has an old steam station as a standby, but the 291 users of electricity are supplied with energy from the 2300-

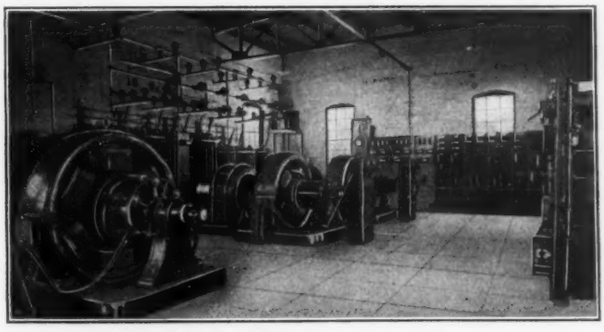


FIG. 5.—SUBSTATION AT TAMAQUA.

volt line connected to the main generating station at Palo Alto through Pottsville. There are 100 incandescent lamps used for public lighting and the connected load is approximately 290 kw.

The greater part of the output of the station at Palo Alto and the substations at Pottsville and Tamaqua is used for street railway purposes. The railway lines of the company extend from Pottsville to Mauch Chunk on the northeast and from Pottsville to Orwigsburg on the southeast. There are also lines to Minersville, Yorkville, Tumbling Run Park, St. Clair and Glen Carbon. The population is well scattered along the valleys contiguous to the railway lines of the company. The passenger service of the railroad companies traversing the territory is not very good and freight trains take precedence over passenger trains. For this reason, also because of more frequent service and cheaper fares, the greater part of the travel-

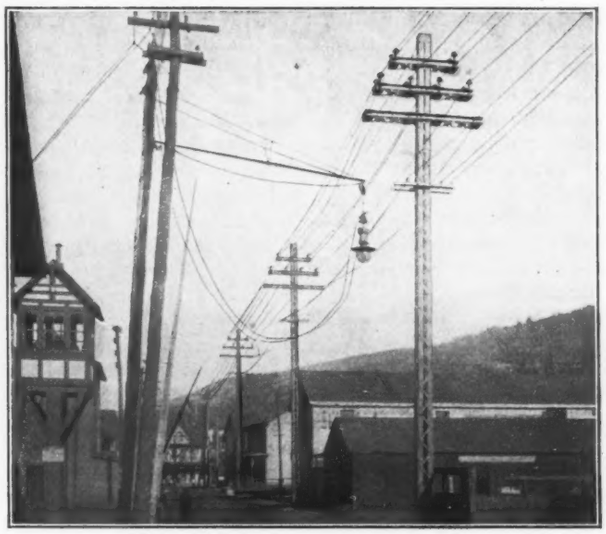


FIG. 6.—VIEW OF TRANSMISSION LINE CROSSING RAILROAD TRACKS.

ing public is carried on the street railway lines. The lines owned and controlled have 68.6 miles of track. The property is operated under the general management of Messrs. J. G. White & Co. of New York, and within the last year the load on the various lighting lines has been increased 50 per cent.

Prevention of Excess Voltage in Motors.

Two patents issued Oct. 6 to Mr. B. G. Lamme deal with a scheme for preventing excessive induced voltages in the field circuit of motors used in combined direct-current and alternating-current circuits. It is well known that, upon the interruption of the circuit of an electric motor, a very high induced voltage often exists momentarily in the circuit as a result of the sudden reduction in the magnetism of the field, and oftentimes this is sufficient to cause a disruptive discharge through the insulation, after which serious injury may occur to the motor when it is again connected to the supply circuit. In commutator motors that are used on both single-phase and direct-current circuits, the excess voltage may be quite large when connected in series for direct-current operation, because the design is such as to allow a very rapid change in the magnetism when the circuit is opened. Hence it is desirable to employ some means for reducing the voltage which is induced upon interruption of the circuit.

According to the invention of Mr. Lamme, the motors are provided with auxiliary field magnet windings which remain open-circuited when the motors are operated by alternating currents, but which are closed-circuited when the motors are operated by direct currents or when they are disconnected from the direct-current supply circuit. The auxiliary field magnet windings in certain cases is connected in pairs in closed circuit and the means for adjusting the motor circuits are so arranged that the induced electromotive forces in the respective auxiliary field magnet windings of each pair are caused to traverse the closed circuit in the same direction when the motors are operated by direct currents and in opposite directions when they are operated by alternating currents. With this arrangement, the auxiliary windings become effective as a means for retarding the rate of change of the magnetic flux when the motors are operated in series by direct currents, but have no effect when they are operated in parallel by alternating currents.

Developed and Undeveloped Water Powers of Georgia.

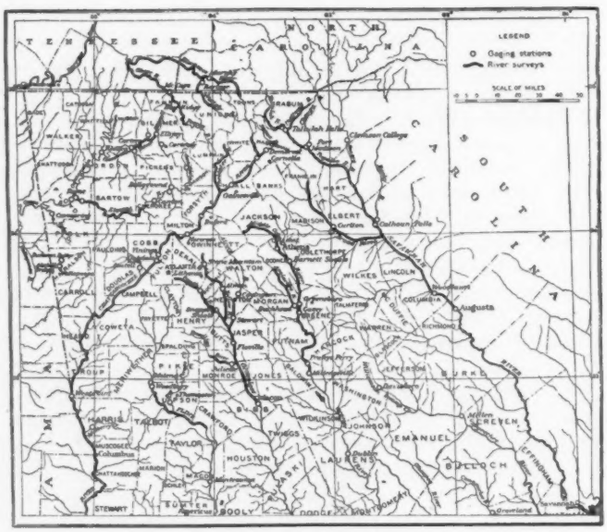
By S. Mays Ball.

THE topography of Georgia, the largest State east of the Mississippi River, is peculiar. Running from the northeast corner of the State in a southwesterly and southerly direction through Gainesville, Atlanta, Griffin, Fort Valley, Fitzgerald, and through the Okofenoke Swamp to the Florida line, is the Chattahoochee Ridge. This ridge divides the waters of the Atlantic from the waters of the Mexican Gulf, and forms the backbone of the State. The great drainage basins on the Atlantic slope are the Savannah, the Ogeechee, the Altamaha, the Satilla, and the St. Marys. Those draining into the Gulf of Mexico are the Suwanee Basin, including the river of that name and its tributaries; the Ochlockonee, emptying into the Ochlockonee Bay; the Apalachicola Basin, including the Chattahoochee and Flint rivers, emptying at Apalachicola, Florida; the Mobile Basin, or Coosa River system, draining to Mobile, Ala.; and the Tennessee Basin, including Hiawassee, Nottely and Toccoa (Ocoee) rivers, which flow through Tennessee and Mississippi rivers, emptying into the Gulf of Mexico at New Orleans. The last basin is cut off from all the others by the Blue Ridge Mountains, which run across the northern end of the State. The streams of these drainage basins rise at elevations of from 900 ft. to 2000 ft. above the sea, and then flow along the high Piedmont Plateau in a succession of cascades until they come to the fall line, where they take the last leap from the granite bedrock to the navigable waters of the younger geologic formations.

Tallulah River.—From the mouth of Popcorn Creek, near the headwaters, down to the mouth of Tiger Creek, a distance of 25 miles, the fall is 265 ft. At a few points in this section the drop is from 5 ft. to 10 ft. in a short distance, and good small power sites are available. In the next four miles below Tiger Creek the fall is 55 ft. This reaches the head of the rapids above Tallulah Falls, at which point there is an excellent location for a large storage dam. The fall from here down to the head of Tallulah Falls proper is 110 ft. Somewhere in this section the water should be diverted to a canal, if the falls proper should ever be developed into a water power, for by beginning the canal at high enough elevation it can be put on comparatively good ground outside the gorge. A large water power can be developed in this section entirely above the falls proper at a comparatively small expense. Along Tallulah River, beginning at Tallulah Falls, is some of the most picturesque and rugged scenery in the South. In 3½ miles the river drops from 1414 to 754 ft. above sea level, or a distance of 660 ft. The principal falls in the order named are: L'eau D'or, 28 ft.; Tempesta, 76 ft.; Hurricane, 89 ft.; Oceana, 41 ft.; Bridal Veil, 17 ft., all occurring within a distance of less than three-quarters of a mile. In the 2½ miles above the mouth of the river there is a fall of 254 ft., all below the falls proper, which could be used for power without interfering with Tallulah Falls.

Tugaloo River.—From the head of Tugaloo River down to the mouth of Panther Creek, a distance of 4½ miles, there are some good shoals, the total fall being 85 ft. The banks are favorable for power development along the entire stretch. From Panther's Creek to Avery's Ferry, a distance of 35 miles, the slope is too gentle and the valley too wide to utilize the river without flooding considerable farming land. Chandler Shoals, 1¼ miles below Avery's Ferry, begin near Bradberry Ferry, and have a fall of 10 ft. in three-fourths of a mile. Three-fourths of a mile below are Hatten Shoals, with a fall of 35 ft. in two miles. These shoals are considered the finest on the river; a 45-ft. dam at them would back the water about four miles, with very little damage to cultivated land. From this point down to the mouth of the Seneca River, which is the head of the Savannah River, the fall is 14 ft. in a distance of four miles.

Savannah River.—The fall in Savannah River for the first seven miles down to the head of McDaniel's Shoals is 20 ft. At McDaniel's Shoals there is a fall of 19 ft. in three miles. Half a mile above the foot of the shoals, at the head of Harper's Island, is an excellent site for a dam about 700 ft. long. In the four miles between this power and the next, at Turner's Shoals, the fall is 12 ft. At Turner's Shoals there is a fall of 17 ft. in about 4½ miles. These shoals begin at Kenly Ferry and extend to Crafts Ferry; the river widens considerably about a mile below Kenly Ferry. There are several good sites for dams, one being on Crafts Island; the river is wide, however, requiring a dam about 1000 ft. long. Half a mile below, at Middleton Shoals, there is a fall of 11 ft. in 1¾ miles, with an excellent site for a dam at the foot of the shoals. In 1½ miles below the fall is 5 ft. This reaches the head of Gregg Shoals, where the fall is 8 ft. in about a mile. Here the river runs between steep hills, and a dam would be about 900 ft. long. Half a mile below Moseleys Ferry are the Cherokee Shoals, having 19-ft. fall in 2½ miles. This is a very fine power site, as the river runs between steep hills. A dam would have to be 1000 ft. long and would be placed about a quarter of a mile above the Seaboard Air Line Railroad Bridge. One and one-quarter miles below the bridge are Trotters Shoals, with a fall of 75 ft. in six miles. These are considered the finest shoals on the river. They commence at the foot of Watkins Island and extend below Tates Mill to Coffer Creek. In this distance there are numerous rocky bluffs, where there are excellent dam sites.



PARTIAL MAP OF GEORGIA.

In the next five miles, extending to the mouth of Broad River, the fall is 11 ft. From the mouth of Broad River down to Little River from the South Carolina side the fall is slight, being 23 ft. in the distance of 16 miles. From this point down to the upper end of Long Shoals the fall is 42 ft. in six miles. The fall is 23 ft. in the next five miles, extending to the foot of Scotts Shoals. From here to the Augusta Dam the fall is 28 ft. in 15 miles. At Augusta the power is fully developed by a dam about 10 ft. high and canal seven miles long. The head is about 50 ft. This power belongs to the city of Augusta. It was developed in 1845-1847, and the canal was enlarged in 1872-1875.

Chattooga River.—Tallulah River unites with Chattooga River to form the Tugaloo. Chattooga River contains many available undeveloped power sites. From its mouth to Warwoman Creek, a distance of 23 miles, the river flows through a wild, rugged country, being a gorge almost the entire distance, which results in a very narrow and swift stream. There are numerous dam sites along this distance, the river being almost one continuous shoal, averaging a fall of 32 ft. to the mile and having a fine rock bottom with rock cliffs on each side. From Warwoman Creek up to Russells Bridge the valley is wide and the fall is much less, being 78 ft. in seven miles.

Broad River.—In the 43¼ miles from the mouth of this river to the foot of Anthony Shoals, the fall is 13 ft., 8 ft. of which occurs

in a distance of one mile at Millford Shoals. Anthony Shoals is the finest power site on the river and is one of the best in the State of Georgia, the fall being 62 ft. in a distance of. 1¾ miles. Several plans have been proposed for developing this power. Probably the best plan is to build a dam near the upper end of the shoal high enough to raise the water at least 10 ft. and to construct a canal to a point near the foot of the shoals. The proposed raise of 10 ft. would back up the water 10 miles to the foot of Fish Dam, where there is a 3-ft. dam 250 ft. long, furnishing power for a grist mill and saw mill. From Fish Dam to the mouth of South Broad River, 15 miles, there is a fall of 23 ft., with no shoal of any consequence. One mile above the mouth of South Broad River are the Detweiler Shoals, with fall of 7 ft. in one-half mile. A mile and one-half farther are the Lower Moore Shoals, with a fall of 7 ft. in one-third mile, with good outcrops of hard rock on both sides. A dam here would be about 350 ft. long. Five miles farther up the river are the Payton Shoals, with a fall of 3 ft. in one-third mile. In the four miles from Payton Shoals to the foot of Moores Shoals the fall is 29 ft. At Moores Shoals there is a fall of 28 ft. in 1¼ miles. Above this point there are several shoals with good sites for dams. The fall is 35 ft. for the first five miles up to the mouth of Blue Creek, and about 5 ft. to the mile above this to the end of the survey at Harrison Bridge.

South River.—From the Southern Railway Bridge, crossing South River near Constitution, down to the head of Albert Shoals, a distance of 20 miles, the fall is about 100 ft. The stream is small, however, and only small amounts of power are obtainable. Flakes Mill, about 13 miles from the beginning point, is the first power now utilized. At this place the dam is about 6 ft. high, and the working head obtained by the use of a short canal is about 11 ft. At Flat Shoals, about four miles further down the river, a new electric plant has been recently established. At Albert Shoals there is a fall of 16 ft. in half a mile. This has been partly developed, but is not now used. At Peachstone Shoals, 36 miles from the initial point, the power is developed by a low dam and short canal, utilizing about 10 ft. head and operating Zackry's grist and cotton mill. At Snapping Shoals, seven miles below, the fall is 20 ft. in 300 yd. This is partly utilized and operates De Loach's woodworking, flouring and grist mills. Three miles below is Island Shoals, where the fall is 10 ft. in 250 yd., and is partly developed at Haley's flour mill.

Ocmulgee River.—At the junction of Yellow and South Rivers is the head of Barnes Shoals, where the fall is 9 ft. in a short distance. A development here would have the additional water from Yellow River. Including the last-mentioned shoal, the fall is 14 ft. from Yellow River down to Alcovy River. Below Alcovy River down to the foot of Lloyds Shoals, one mile above Pittsmans Ferry, the fall is 55 ft. in little less than five miles. The continuous shoals which make up this fall of 55 ft. are known locally as Dotsons, Barnetts, Barnes, Capps and Lloyds. The most precipitous part of this slope is the lower half, which has a fall of 43 ft. in 2½ miles and is known as Lloyds or Capps and Lloyds shoals. Surveys have been made for a 60-ft. development of this power to back water to the foot of Barnes Shoals, near the mouth of Yellow River, and to raise the water level 5 ft. at the mouth of Alcovy River. This development can be made with a dam near the foot of Lloyds Shoals, or, as contemplated in the surveys mentioned, by a lower dam farther up and a canal. Smiths Shoals, extending from below Giles Ferry to Smith's mill, has a fall of 12 ft. in 1½ miles. This is partly developed for Smith's mill by a low dam and long, small canal. The next power below is at Lamar's mill, a large merchant mill for grinding corn and wheat. The fall here is about 20 ft. in one mile. About 16 ft. of the fall is partly developed by a wing dam and a short canal. If the dam were extended and raised 4 ft., the head would be 20 ft. without backing water on the next property above. The last three powers mentioned, Lloyds, Smiths and Lamars, are above Flovilla Hydrographic Station, located at Lamars Ferry. The next power is at Juliette, where the fall is 15 ft. in one-half mile. This is developed by dam and short canal and operates the Clover cotton mills and Juliette Milling Company's plant. From the tail water below the Glover mill to the mouth of Beaver Dam Creek, below Holton, a distance of 18 miles, there is a fall of about 60 ft. Macon capitalists have had surveys made for a proposed development of this fall, or a portion of it.

Yellow River.—Yellow River flows in a southeasterly direction and joins South River, forming the Ocmulgee. It contains some valuable power sites, both developed and in a natural condition. One-half mile above its mouth are the Indian Fishery Shoals, where there is a fall of 12 ft. in about 200 ft. The river here is about 300 ft. wide. A grist mill and cotton gin in operation use perhaps nine-tenths of the available power. For 13 miles above, the river runs between high banks, alternating with low bottoms without any marked shoals (except at Lees, where there is a fall of 2½ ft.) to Langdon Shoals. The total fall in this 13 miles is 23 ft.; Langdon Shoals has a 4-ft. fall. Three miles above, at Porterdale, is the finest power site on the river, where extensive developments have been made by the Bibb Manufacturing Company, which has a large cotton and twine factory at this point. Here there is a fall of 67 ft. in one-half mile, with a 12-ft. dam at the upper end of the shoal. The banks at the foot are very high, but gradually lower, until just above the dam large bottoms begin and continue for five miles. This water is backed up as far as the mouth of Hurricane Creek, five miles above. The next power, McDaniels Shoals, has a 7-ft. fall in a very short distance, and there is now a 6-ft. dam operating a grist mill. At Milstead, 4½ miles above, there is a fall of 45 ft. in one-half mile; this power has recently been developed to operate a large cotton mill. Eleven miles above is Anistown Shoals, with a 25-ft. fall below the 11-ft. dam, which formerly supplied storage for power to operate a cotton mill. The banks here are all hard rock and the site could be developed into very valuable property. Two and a half miles above are some shoals, with a 14-ft. fall in half a mile. Above this point the river flows through a very rough country, having a fall of about 36 ft. in six miles, but passing no important shoals until the next power is reached at Yellow River, Ga., the end of the survey. Here is a dam 7.3 ft. high, which operates the Simon roller mills.

Alcovy River.—From the mouth of Alcovy River up to the foot of White Shoals, a distance of 9 miles, the fall is 25 ft. White Shoals and Newton Factory Shoals form one continuous series with a fall of 83 ft. in a mile. Here the river is a gorge 300 ft. wide with banks over 100 ft. high in several places. Near the middle of this shoal is an excellent sit for a dam from which a canal of about one-half mile long would be required. At the upper end of the shoals is another good site for a dam, which would have a much greater storage basin, as just above the gorge widens a great deal and a large volume of water could be stored through the dry season. This development would require a canal for the entire length of the shoals. An old corn mill is in operation at this point using a small wooden dam to divert the water into its flumes. Many years ago a large cotton factory stood on this site, but was burned and never rebuilt. Six miles above these shoals are Henderson Shoals, with a fall of 2 ft. To obtain power for a grist mill a 6-ft. dam has been erected, the backwater from which extends to Dabneys Bridge, 4 miles above.

Towaliga River.—Towaliga River flows in a southeasterly direction and empties into Ocmulgee River. From its mouth up to the foot of High Falls, a distance of 21 miles, the fall is about 100 ft. The stream is narrow and swift, but has no marked shoals in this portion nor any favorable power sites. At High Falls there is a fall of 95 ft. in a distance of 1000 yards, in the middle of which there is a sudden drop of 42 ft., known as High Falls. This is an excellent power site, for although the low-water flow is small, there is a good basin above for storage. This power has been recently developed and an electric plant installed.

Oconee River and Tributaries.—At Milledgeville a large mill for grinding wheat and corn is operated by water power for the development of which is a low dam across Oconee River and a

canal along the west bank about one-half mile long. At the foot of Furmans Shoals, about four miles above Milledgeville, begins a very fine water power. The fall here is 41 ft. up to the mouth of Little River, seven miles above, about 30 ft. of the fall being in half the distance. Extensive surveys for the development of the power have been made and recently it was proposed to develop about 50 ft. of head, backing water above the mouth of Little River. From the mouth of Little River to the foot of Laurens Shoals, a distance of 19 miles, the fall is 56 ft. and almost uniformly distributed. At Laurens Shoals the fall is 31 ft. in 3½ miles. Immediately above, at Rileys or Methodist Fishery Shoals, the fall is 30 ft. in three-quarters of a mile, and continuing up the river the fall is 15 ft. in the next 1½ miles to the top of Long Shoals. The last three shoals have a total fall of 77 ft. from the foot of Laurens Shoals to the head of Long Shoals, a distance of 6¼ miles. At Parks Mill, 3½ miles below the mouth of Apalachee River, the working head is 10 ft., developed by a dam of that height. In the 22 miles above Parks Mill to the foot of Scull Shoals the fall is only 25 ft. At Scull Shoals the fall is about 6 ft. in several miles length. At Barnetts Shoals there is a fine water power, the fall being 51 ft. in 2¼ miles. About three miles above is the junction of North Oconee and Middle Oconee Rivers. On each of these streams there are several developed water powers in the vicinity of Athens.

Chattahoochee River.—At Columbus is the fall line and immediately above are located the largest falls on the river. Here a large amount of power has been in use for many years. The developed water powers are: (1) Eagle and Phoenix dam, operating the Eagle and Phoenix and Muscogee mills; fall, 26 ft. (2) City Mills dam; fall 9 ft. (3) Columbus Power Company, dam and tailrace; fall 40 ft. The last-mentioned was completed in 1902. The stone dam is located above the foot of the shoals, a considerable portion of the head being obtained by excavating for the tail-water. Water is backed three-quarters of a mile above the dam and reaches the foot of a very fine shoal, the Chattahoochee Falls Company's property, where there is a fall of 40 ft. in little more than a mile. The old Clapp factory was located on this property and the power was supplied by a wing dam, about half of the fall being used. The present owners of the property have secured water rights along the river above, which will enable them to develop a much higher head and also give a larger storage. The fall from the upper line of the original property to the foot of the shoals on Ogletree's land, is 21 ft. in seven miles; from this point up to the lower end of Hargetts Island, 10 miles above, the fall is 150 ft. Along this portion of the river the banks are high and rocky. The river is mostly wide and full of islands, but at several places the banks come close together, affording excellent sites for high dams, and, in some cases, not more than 600 ft. long. In the seven miles from Hargetts Island to the foot of Riverview dam the fall is 42 ft. At Riverview mills and Langdale mills there are developed powers, each using 10 ft. or 12 ft. of fall. Above the Langdale mills up to West Point the amount of fall is small. Between West Point and Franklin the fall is 75 ft. in 38 miles, averaging about 2 ft. a mile. The fall is not uniformly distributed, however, and it is probable that some really good power developments could be made. At Franklin, where there is an excellent site for a dam, extensive surveys have been made for one 32 ft. high, which would back water 8½ miles to the head of Fishtrap Shoals. This proposed development includes Bushyhead Shoals and several others not so large. From here to the foot of McIntosh Shoals the fall is only 11 ft. in 11 miles. At McIntosh Shoals there is a fall of 8 ft. in half a mile. Above this shoal to the mouth of Peachtree Creek, above Atlanta, the fall is 66 ft. in 47 miles. Three miles above is the dam site of a proposed development of 32 ft., for which complete surveys have been made. At Bull Sluice, four miles below Roswell, is the new electric power plant of the Atlanta Water Power & Electric Company. The dam is a massive concrete structure, 48 ft. high, which, with the 2-ft. flashboards, gives a head of 50 ft. The plant is fully equipped with the most modern type of water wheels and electric generator. The combined rating of the water wheels is greatly in excess of the normal low-water flow of the river, thus providing for a large increase of power from stored water and at times when the flow in the river is increased. The power is all transmitted electrically to Atlanta. Backwater from this dam, when flashboards are used, reaches a point just under the wagon bridge at Roswell, which is four miles away.

In the 26 miles above Roswell, reaching to Bowmans Island, near Buford, there is a fall of about 57 ft., the drop being as much as 5 ft. or 6 ft. to the mile in several places. At Bowmans Island is a proposed site for a 50-ft. dam to back water 14 miles up to the mouth of the Chestatee River. From the mouth of the Chestatee River up to the mouth of the Little River there are a number of small shoals aggregating 28 ft. of fall. Beginning a short distance above Little River is a series of shoals which has recently been developed by the North Georgia Electric Company. The dam of this plant is located a quarter of a mile above the foot of the shoals, leaving about 7 ft. of the fall undeveloped. It is a log-crib structure, entirely filled with rock, and is 36 ft. high. The power is transmitted electrically from the plant. Backwater extends eight miles to above Clarks Bridge in the next 11 miles up to Belton, where the fall is about 30 ft. and includes several shoals and some good sites for dams. In the next nine miles extending to the mouth of Soque River the fall is 81 ft., including Harrisons Shoals, Perkins Shoals and a series of shoals above and below Duncans Bridge, the latter series having a fall of 20 ft. in 1¼ miles. Above the mouth of the Soque River is a series of shoals with a total fall of 106 ft. in 4¼ miles. Along this part of the river the banks are steep and rocky, and there are numerous good dam sites.

Soque River.—In 5½ miles above the mouth of the river the fall is 30 ft., including several small shoals. One mile down stream from Porter Mills there is an undeveloped fall of 6 ft. in about 50 yards, with 7 ft. of fall above, to the foot of Porter Shoals. At Porter Mills is the Porter Shoals, almost a vertical drop of 48 ft., and by far the best waterfall on the river. This is partly developed by a wing dam, the power being used to operate Porter's woolen and cotton factory, four miles from Demorest, the nearest railroad point. About 500 ft. up-stream is Porters Upper Shoal, with a 15-ft. fall and also partly developed by a small dam and supplying power for factory No. 2 of the same company. A much greater head could be obtained here by increasing the height of the dam. One and one-half miles above Porter Mills is a good water power site known as Old Factory Shoals, where there is a fall of 23 ft. in a distance of 600 ft. This was utilized at one time, but all signs of the dam have vanished.

Chestatee River.—From the mouth of the river up to the foot of the North Georgia Electric Company's dam at Newbridge, a distance of 17½ miles, the fall is 83 ft. This includes three small dams and a number of undeveloped shoals, but no especially favorable sites for large powers. The North Georgia Electric Company's dam is 27 ft. high and is made of log cribs filled with rock and backs water about 3¼ miles. Above this dam there is a large amount of fall and many good power sites, some of which are developed and used to operate machinery connected with gold mining. Most of the undeveloped powers are owned or controlled by various mining companies in the vicinity.

Flint River.—The country rock in the Flint River basin over the range of the preceding elevations is vitrified sandstone or quartzite, forming fine bluffs and occasional narrow gorges suitable for dam sites. It is easily quarried and comes out in square blocks that are excellent for building dams.

The first shoals, known as the Dripping Rock Shoals, begin near the mouth of Cane Creek, about 3000 ft. below the ridge, and fall 23.7 ft. in about two miles. In the next two miles or to a point about one mile below the mouth of Pigeon Creek the river falls only 6 ft. Then shoals begin which have a practically uniform fall of 10.5 ft. per mile for a distance of 8½ miles or to Double Bridges (Gibsons Old Ferry), the total fall in that distance being 90 ft. From that point to the north boundary of

the twenty-third land district the fall is 20 ft. in a distance of 4700 ft. In the next three miles, or to the head of Yellow Jacket Shoals, there is a total fall of 22 ft. The Yellow Jacket Shoals are the finest on the river. They are below Pigeon Creek and above Lazer Creek (sometimes called Eliza Creek) near Rowland, in Upson County, about midway between Talbotton and Thomaston, in the heart of the cotton belt of Georgia. They have a fall of 65 ft. in a distance of 7900 ft., or 1½ miles, all of which can be utilized. In fact, a much larger head would be available by building a 42-ft. dam at the head of Yellow Jacket Shoals and taking the water in a canal to a point opposite the foot of the shoals. This would cover a fall of 107 ft., 7 ft. of which would be sufficient for storage and canal grades, leaving a net working head of 100 ft. A dam of this height would back the water about four miles. There would be no trouble from flood water on the wheels, for the river is very precipitous below the foot of the Yellow Jacket Shoals, having an average fall of 6 ft. to the mile in the next 10 miles, the most precipitous part being a fall of about 25 ft. between Hatchasofkee Creek and Elliotts Ferry, a distance of about two miles. Elliotts Ferry is between the mouth of Mountain Creek and Deep Gulch Creek. Below Elliotts Ferry the river falls 13 ft. in the next two miles, or to Walkers Ferry, and then assumes a practically uniform grade of 1.7 ft. to the mile for the next 11 miles, or to a point one-half mile below the mouth of Auchumkee Creek, in Crawford County, which is at the head of small shoals having a fall of 10-ft. in a distance of one mile. This practically is the point where the river crosses the fall line and enters the younger geologic formations. The survey ends there. Along the portion of the river surveyed there are several large tributaries which have fine shoals. The most notable of these is Big Potato Creek, near Thomaston, in Upson County, which has three shoals near its mouth, surveyed in 1891 by Mr. C. C. Anderson, assistant state geologist, and reported by him as follows: Rogers Shoals, 81 ft. fall in a distance of 3500 ft.; Nelsons Shoals, 115 ft. fall in a distance of 2700 ft.; and Daniels Shoals, 13 ft. fall in a distance of 150 ft.

About 10 miles above Woodbury there is a fine water power on the Flint River one mile from Neal, on the Southern Railroad. It is known as Flat Shoals and has a fall of 32 ft. in a distance of 3000 ft. There is a natural storage basin just above these shoals, where it is estimated that a 2-ft. dam would store the low-water flow of the river for 12 hours, and that a 4-ft. dam would store it for 38 hours. This power was surveyed by Mr. B. M. Hall and can be developed by a canal 3000 ft. long or by a dam at the foot of the shoals where there is a narrow shut-in.

Etowah River.—From Rome up to the Western & Atlantic Railroad crossing, near Cartersville, a distance of 45 miles, the Etowah River is mostly swift, but has no large shoals. The total fall is about 115 ft., which includes numerous small shoals. At a few places the fall is 5 ft. or 6 ft. in a mile or less, and at one place near Kingston the fall is 33 ft. in 8½ miles. One and one-quarter miles below the railroad bridge at the old Tumlin mill site is the large corn mill of the Etowah Milling Company, utilizing about 6 ft. of fall. Immediately below the railroad bridge is an old mill site from which the mill and 5-ft. dam are entirely gone. About two miles above the railroad bridge begins a very fine water power, which was once partly developed, and before the civil war operated the Cooper Iron Works and a large flour mill. At present only the ruins of what is said to have been a half-million dollar investment are to be seen. This power has a fall of 90 ft. in about six miles. Above this point are numerous good small power sites, some of which are developed, but no great falls occur until the upper portion of the river is reached. On Amicalola River, a large tributary of the Etowah, and on the Etowah River above the mouth of the Amicalola, there are many excellent shoals having large amounts of fall only awaiting development.

The writer is indebted to Mr. S. W. McCallie, geologist of the State of Georgia, for much valuable data used in this article.

Modern Steam and Hydraulic Generating Stations in Japan.

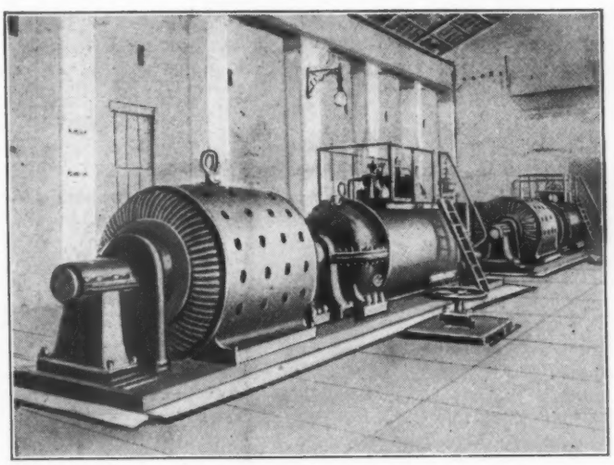
By M. Kawara.

The Tokio Electric Light Company is the oldest and largest of the kind in Japan, having been started in 1888. At the beginning it was a very small affair, the total load being only 1000 incandescent lamps, but the business of the company grew year by year steadily, and at present the output is about 30,000 kw, which is distributed all over the city by eight substations.

The first generating station was built in Asakusa, in the northeastern part of the city. The machines here installed were of a type now obsolete—Edison bipolar direct-current generators. Year after year additional machines, such as alternators and Brush arc dynamos, were put in, so that the station at present contains an interesting collection of machines illustrating the development of electrical design. But this is not the station which will be made the subject of this article.

In recent years the Tokio company built a steam-turbine station in Senju, a suburb of Tokio, and a hydro-electric station in the province of Kai, both of which are considered to be typical modern plants in Japan.

The construction work of the Senju station was started four years ago, and two years later regular operation of the machines was begun with four 1000-kw turbine generators. The hydro-electric plant was completed this year. A brief account of this



SENJU POWER HOUSE TURBINE ROOM.

latter station was printed in the Electrical World, April 8, 1908, and a description of these two plants will here be given.

SENJU STATION.

The Senju station is located between the Arakawa River and a railway line, which runs along the banks of the river. There is, therefore, an almost unlimited supply of water and an easy means of fuel transportation. The brick building, covering nearly an acre, is divided into three main rooms, namely, a boiler room, 182 ft. x 111 5/24 ft.; economizer room, 182 ft. x 28⅜ ft., and a generator room, 182 ft. x 46 ft. The condensers are located in a pit in the generator room.

There are two batteries of boilers facing each other, each containing six units. One of the batteries consists of British Babcock & Wilcox 300-hp water-tube boilers, 150-lb. gage-pressure, with a 150-deg. superheat attachment. The other battery consists of American Stirling 500-hp water-tube boilers, with the same pressure and superheat attachment. The economizers are six in number, each with 192 water-tubes, 4 9/16 in. in diameter, 9 ft. long, giving a total heating surface of 1900 sq. ft. A 1-hp shunt-motor connected to the exciter is attached to each unit for working the tube scraper. Two feed pumps are also installed in the economizer room, both of the plunger type and actuated by tandem compound engines.

More attention is paid in Japan than in America to the con-

struction of chimneys, owing to the frequent occurrence of earthquakes. Experience shows that the natural period of vibration of a high chimney is much longer than of houses of ordinary height, hence either one or both are destroyed in case of violent shakes if house and chimney are connected. As a consequence, high chimneys are always built a short distance from the surrounding houses. The two chimneys of this plant are located adjacent to the boiler room, but not very close to it, and are of what is called the earthquake-proof type. The brickwork is covered with steel-plate shells from top to bottom. The total height is 150 ft., the inner diameter of the shell being 26 ft., and the inner diameter of the brickwork, 9¾ ft.

Four Westinghouse-Parsons 1000-kw turbines of 1500 r.p.m. are direct connected to four Westinghouse generators. With 145 lb. pressure, 150 deg. superheat and 28-in. vacuum, the turbines are guaranteed not to consume more than 12.7 lb., 13.1 lb. and 13.8 lb. of steam per hp-hour at full load, three-quarter load and half load, respectively. The speed regulation is 2 per cent, and when the speed reaches 20 per cent above the normal an automatic valve shuts off the steam supply entirely. There are four surface condensers, one for each turbine, built by Allen & Company, of England. The air pumps are of the vertical three-cylinder, single-acting type. For circulating condensing water centrifugal pumps are used. The power for actuating these mechanisms is obtained from three-phase induction motors connected to the main busbars through delta-connected non-inductive load. No accurate test, however, has been made.

The generators operate at 3500 volts, 50-cycle, three-phase and are of the four-pole, revolving-field type. The armature windings are guaranteed to stand a momentary voltage of 8000, and the field windings 10,000 volts. The specified temperature rise is not to exceed 40 deg. C. at full load. The efficiency is 95 per cent, the voltage rise being 8 per cent on non-inductive load. No accurate test, however, has been carried out to see if these specifications were fulfilled.

Two exciters of 100 kw each are also of Westinghouse make. One of them is direct connected to a vertical compound engine, and the other to a three-phase induction motor, which takes power from the main busbars. The former is used only when no generators are in operation.

The switchboard arrangement is very simple owing to the absence of step-up transformers. There are four generator panels, two exciter panels, two high-pressure power-circuit panels, one direct-current power-circuit panel, four three-phase feeder panels, six single-phase feeder panels, and one panel for station lighting. All of these are of General Electric make.

KATSURA RIVER HYDRO-ELECTRIC STATION.

Long before the Senju station was completed it was evident that the combined output of the Asakusa and Senju plants would not be sufficient to meet the growing demand for power. Accordingly work on the Katsura River station was started two years ago and brought to completion this year. Of all hydro-electric plants now in operation in Japan this plant has the largest capacity and employs the highest line voltage.

The station is located in the mountainous region of Kai province, 47 miles from Tokio. Water is taken from the upper reach of the Katsura River. The masonry dam across the stream is 96 ft. long and 8 ft. high above the river bed. Stone and concrete were used in a lavish manner to insure an ample margin of safety even in case of high floods, which are quite frequent in the summer time. The intake is 22,230 ft. from the forebay of the power house, of which distance 10,150 ft. are covered by nine tunnels, the rest being open channel. The average width is 11 ft. at the bottom and 20 ft. at the water level, and the depth of water is 9 ft.

The forebay is located on the hilltop back of the power house. It is 85 ft. x 66 ft., with an everage depth of about 13 ft. Six riveted main steel pipes, 60 in. in diameter, for the generators and an auxiliary pipe for the exciters, run down to the station in parallel lines. The fall thus obtained is 345 ft.

The station consists of two buildings, a one-story house for the generators and waterwheels and a building for transformers and switchboards. Both of these are built of bricks and have wooden roofs. Each of the six waterwheels here installed is of Swiss make, Francis type double turbine, with Lombard governors. The capacity is 4500 hp each at 500 r.p.m. The generators are supplied by the Siemens-Schuckert Company, Germany. They are 3900 kv-amp, 6600-volt, 50-cycle, three-phase, revolving-field machines. The exciters, two in number, are direct connected to 265-hp waterwheels. The current generated here is conducted by cables to the transformer room, where the pressure is stepped up to 60,000 volts. The transformers are of the General Electric Company's oil-immersed, water-cooled type, with 2000 kw capacity each. Nine of these are connected in three groups in delta and installed separately in fireproof compartments. Provisions are made to draw out the transformer oil quickly in case of fire. Difficulties were met with in setting up the transformers owing to the dampness of the atmosphere, but no weakness has developed, though the plant has been in operation for over six months.

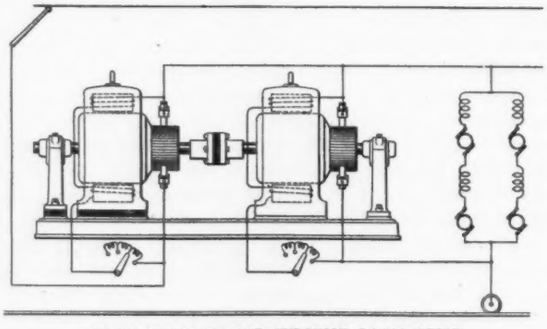
For the transmission lines, wooden poles were adopted except where very long spans were an absolute necessity, such as in crossing rivers and valleys. At these places steel towers were erected. The entire line, about 47 miles in length, was duplicated and switching stations were constructed at short intervals, so that any section of the line can be cut out in case of trouble. The line conductors are hemp-cored, stranded bare-wire cables of domestic make. At the city end of the line, the receiving station is located in Waseda, near Count Okuma's famous college, whose baseball team came over to this side of the Pacific some years ago. Here the pressure is stepped down to 11,000 volts and distributed to other substations in the city.

The transmission line passes a region of very frequent thunder storms. Last summer men working on line construction had severe shocks several times when no machine was in operation in the generating station. These incidents and other considerations led the company to take special care in installing lightning arresters. At present, General Electric multiple-gap arresters and Siemens-Schuckert water-jet and horn-type arresters are installed at the terminal stations and a midway substation, and additional horn arresters are installed at short intervals along the line.

The total cost was about $3,000,000, or $150 per horse-power.

High-Voltage, Direct-Current, Motor-Generator Locomotive.

In order to overcome the voltage limitation in direct-current railway systems the scheme of connection illustrated herewith has been proposed. A motor-generator balancer set is used to



DARLINGTON DIRECT-CURRENT LOCOMOTIVE.

divide the high-voltage impressed upon the trolley at some point suitable for operating direct-current railway motors. The motor of the balancer set is placed in circuit nearest the trolley conductor and its frame-work is insulated from that of the generator and from the ground. Thus the voltage strains upon the insulation of the machines are not excessive, especially since they are subjected to a service less severe than the propelling motors. By means of field-circuit rheostats the voltage impressed upon the propelling motors may be varied throughout. A patent was issued to Mr. F. Darlington on June 9.

The Pruning of Street Trees.

By E. J. Harper.

The proper care of the street tree is a subject to which few have given serious thought. Nothing adds more to the beauty and health of a residential street than well-cared for trees, and their presence also adds to the value of the property that they border. In all cities, however, there has been much crude and even criminal pruning of trees due to ignorance, thoughtlessness or to the spirit of commercialism. Private individuals and public utility companies alike have slashed the trees until all shape is gone and the beauty of the tree ruined for all time. The remedy for this is to place the care of the street tree in the hands of a city forester or tree warden.

The human being and the tree are in many respects alike: both have to feed that they may live, both have circulation, the one blood, the other sap, and both have periods of activity and rest. The human being has a period of infancy, childhood, maturity and old age; the tree would also have these stages in its existence were it not killed before it reached maturity. The abnormal shapes, the sickly looking specimens and the dying trees along streets are in a measure due to public utility companies. If no one were allowed to trim a tree unless he held a certificate showing him to be qualified to undertake such work, or unless he did it under the direction of the city forester, no complaint could arise.

The relation of the utility company to the street tree is a vital one and a most vexing problem to a city forester. In this strenuous age, telephonic communication and electric-light connections are imperative. If all the wires were placed in conduits the problem would be solved; but for many cities the day for conduit wiring is very far distant. Where a city has an adequate alley system the poles and wires can be placed there and not permitted on the streets, but where this is lacking the question of how to have good trees, telephonic communication and electric light becomes a serious problem. Civic organizations, however, have been formed in many cities and these protest more and more against tree butchery. In many cities the idea exists that public utility companies butcher trees without thought of their beauty or health, and in some instances this idea is well founded. The trimmers, mostly inexperienced men, have cut right and left to free the wires and have played havoc with the trees. In some cities this has been changed and there is a vast improvement in the pruning done by the companies. The latter have shown a disposition to meet the city forester's requirements and have employed experienced men to do the work. The Pacific Telephone & Telegraph Company, of Los Angeles, for instance, employs a man who has had years of experience and who gives all of his time to the work of tree pruning. About 2000 permits have been issued to this company during the year, and there has not been more than half a dozen complaints regarding the trimming. Before this office was created, the trees had great pie-shaped cuts made in the very heart of the crown, or the tops were so pruned that the trees looked as if an attempt were made to form a dance-hall floor of the tree top. Fig. 1 is an illustration of this class of trimming. The poles on the street are only 25 ft. high and a perfect network of wires runs over the tops, which, unfortunately, does not show in the photograph. The trees can never be shaped so long as such pruning of the tops is carried on. The pepper trees on the right were cut some years ago, pie-shaped, but have since filled the cut and the city forester has prevented further mutilation.

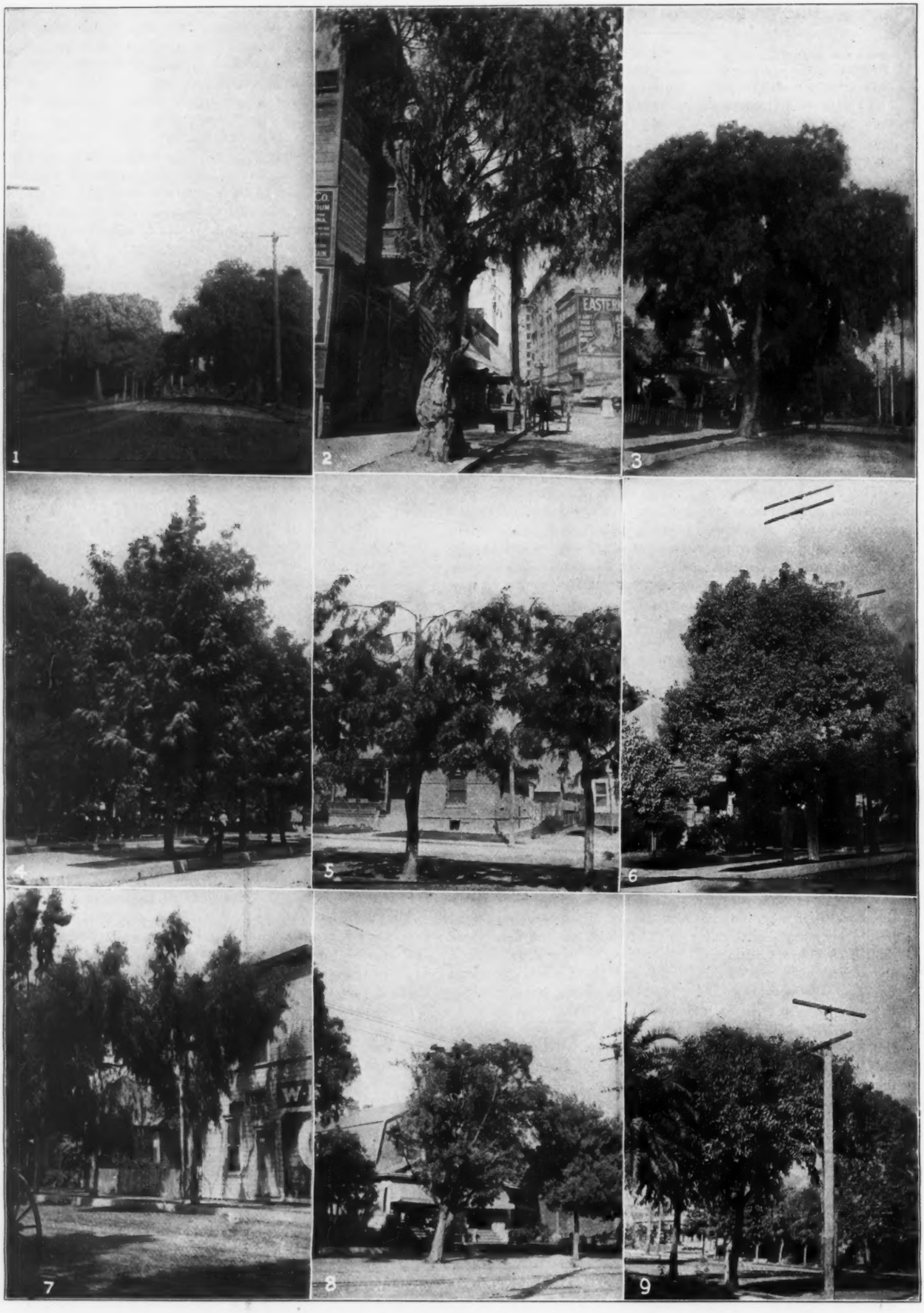
Different varieties of trees demand different treatment in pruning, but there are certain principles which apply to all pruning. The first thing to be considered in trimming a tree is where to make the cut. The average person who has not made a study of pruning would sever the limb some 3 in. to 6 in. from the trunk with the result that the stub rots back to a certain point called the shoulder. It takes from five to six years for this stub to rot and drop out, and all this while the tree has a festering sore in its side. A fungus growth almost invariably forms in the rotting wood and spores from this eat into the heart of the tree. When the stub does drop out, the tree is marred for life probably, and if the spores of the fungus have got into the heart, the tree is doomed. These spores produce dry rot, for which disease there is no cure. The heart wood and limb become wholly rotten and there is no sound wood remaining, only a thin supporting shell of sapwood. A wind storm or the weight of the crown causes the limb or tree to fall. An oak tree frequently becomes so diseased from such trimming that the bark is affected, breaks or fissures badly and falls away leaving bare patches. Fig. 2 shows clearly the result of this kind of pruning. The pepper tree shown is about 40 years old and should be a beautiful tree; but some time in the past six years a large limb was severed about 6 in. from the trunk and the tree is now doomed to an early death, because the limb was cut at the wrong place.

When a branch is to be cut off there is but one correct place to make the cut. Just above where the branch leaves the trunk there is usually a prominence called the shoulder. At this point nature always makes vigorous efforts to heal wounds, and here the cut should be made. Limbs should not be cut off with an ax, but with a saw. Inasmuch as there is a tendency for the wood and bark to split down, if care is not taken the bark will peal for a foot or more and make a bad wound that will retard the growth of the tree, if nothing worse happens. To avoid this, a cut should be made a foot or more from the trunk and then one can manage the stub without danger of the bark splitting. If it is impossible to use a saw, then a trained man should make the cut with an ax, striking up from under the limb. After the limbs have been removed, the wound should be treated by painting the scar with a coating of tar as an antiseptic. This will prevent the entrance of disease spores and encourage the bark to grow and close the wound. Neglect here may not show immediate results, but a few years later the tree may be destroyed during a wind storm or manifest a permanent decline. The importance of painting the wound, therefore, cannot be too strongly emphasized. If these directions are followed, very large branches can be cut from trees without any serious evil resulting; if they are not followed, the cutting of a comparatively small limb may cause the untimely death of a fine tree.

The question of the time to prune is one of interest. In semi-tropic California trees may be pruned at any season, but a tree should never be trimmed when the sap starts into an active flow. At such a time the bark strips very easily and there is danger of making a large wound, besides the sap is thin and flows very freely; it is, therefore, hard to make paint stick to the wound and the tree bleeds to death. Heaviest pruning should be done in the early fall months, but there is more or less trimming going on all the time.

It is in the pruning of the head of the street trees that the public utility companies are directly interested. The under branches seldom worry them and are not often pruned by them, but because their poles are low they frequently ruin the tops in order to free their wires. It is dealing with this branch of pruning that one needs most to study the different variety of trees. Almost each variety requires different treatment. All permits granted in Los Angeles have printed upon them in prominent type, "The trees must be trimmed so as to preserve their symmetry." This has caused the trimmers to give some attention to the nature of the tree and its growth, and has resulted in a marked improvement in the trimming over that of previous years. The grevillia requires a great deal of pruning. If allowed to grow naturally it soon becomes so top-heavy that its branches are broken badly by even light winds Its wood is brittle and breaks with ease and the bark has a tendency to strip down when thus broken. But with frequent trimming and by shaping the head in somewhat of an oval, and by keeping the head under 40 ft. a most beautiful street effect may be secured. Fig. 4 shows this tree properly pruned. Fig. 5 shows the same variety of tree butchered by inexperienced trimmers. In the latter case the only idea was the freeing of the wires, and it will take years for these trees to regain the beauty that was destroyed in a few minutes by ignorant men.

The tops of trees should be pruned from ladders or derricks on wagons. The trimmer should never climb the tree. Some



FIGS. 1 TO 9.—THE PRUNING OF STREET TREES.

trimmers for utility companies use spurs on their boots for climbing the trees and reaching the objectionable branch. A number of street trees have been lost from this cause. The spurs make wounds that cause bleeding and many trees never recover from them. Then disease spores enter through these wounds, and though the wounds heal the damage is done and the tree never recovers. Moreover, the symmetry of the tree cannot be studied from amid its branches.

The black acacia should be permitted to send its leaders up after one or two cuttings. It will make a much more beautiful tree if this is done and in time will reach the height of 50 ft. or 60 ft. Of course, it is in the way of the wires; but, by using poles 40 ft. high and keeping the tops just under the wires, fairly good trees are secured. The effect, however, is nothing like as good as if the tree is permitted to grow to its natural height. The artificiality of the flat top is not pleasing as one looks down the street. The desired effect might be secured by placing the wires in cables. Poles could then be lowered, if desired, by the companies.

The beauty of the pepper, like the elm, lies in its spreading top. This tree should never be trimmed in an artificial shape, nor should its crown be circumscribed. But as its crown is never so compact as the acacia, for instance, its grace is not marred by cutting out some of its inner branches. So the utility companies by the use of the "ring construction" may run their wires through this tree and secure free passage without destroying its beauty. Of course, the use of insulated cable is preferable, but the ring construction may be used with careful pruning of the inner branches. The crown of this tree should never be formed lower than 15 ft. or 20 ft. above the sidewalk. Fig. 3 shows the tree well trimmed with the crown some 20 ft. above the walk. The crown should be permitted to grow as tall as it will and to spread as far as it likes.

The sterculia is a tree that grows well in any deep soil and is excellent for planting in narrow parkways, as it has no large lateral roots. This tree grows conical in shape, and should never have its leader cut as it never recovers from such trimming. Poles 40 ft. high will keep the wires out of the way of this tree for a number of years, and then the cable or the "ring construction" will save the tree.

The camphor tree is easily pruned. In the spring when its young growth is on there is no more beautiful tree. Fig. 6 shows the camphor properly pruned. The trees are 12 years old and are 30 ft. high. The poles are here 40 ft. high so that the trees have not yet come into contact with the wires. In time they will grow very tall and have a large spread, but as the top becomes more open as they grow older the crown may be pierced by the wires without destroying its beauty. Of course, the ring construction or the cable will have to be used. The practice of the utility companies of putting cross-arms on their poles some 6 ft. long and then stringing them with as many wires as the arms will carry has resulted in much harm. No tree can send its leaders through such a network of wires unharmed, and the wires must of necessity suffer from the constant chafing of the branches. To keep the branches trimmed below this network of wires is to make a monstrosity of a tree. Figs. 7 and 9 show the result of such practice. In each case the poles are not over 25 ft. high and on the cross-arms there are some 18 to 20 wires. Each year the tops of these trees have been cut off just below the wires, so that now, though this has been forbidden, the trees cannot recover from such pruning for several years, if ever. The companies, of course, wish to save expense, but it is questionable whether one should be permitted to destroy or mar a street tree in order to save a few dollars. Fig. 8 shows an acacia tree ruined by such pruning.

CENTRAL STATION

MANAGEMENT, POLICIES AND COMMERCIAL METHODS

Irrigation Pumping Around Denver.

The Denver Gas & Electric Company is getting considerable business from irrigation pumping in the suburban districts of Denver. This is made possible by the fact that a short distance below the surface a good water supply is available, and by putting in an electric motor with a centrifugal pump of moderate lift, it can be brought to the surface. About 50 irrigation pumps are in operation. These are mainly on a rate of 4 cents per kw-hour, plus $1 per horse-power installed per month. The motors range from 5 to 15 hp.

A Plan to Encourage Porch Lighting in Colorado.

A plan is being put in force in the towns and villages served by the Northern Colorado Power Company which is designed to encourage the use of electric porch lights and to make more general the custom of turning on porch lights during the entire evening. The plan as it works in Fort Collins, for example, is as follows: The rate per kw-hour in that town is 12.5 cents. The minimum bill is $1.25. If a consumer will install an 8-cp porch light, the company will allow him 10 kw-hours in excess of his minimum bill for 50 cents per month in addition to the minimum bill. In other words, the consumer guarantees a minimum bill of $1.75 per month instead of $1.25, and for $1.75 is allowed to consume 20 kw-hours instead of 10 kw-hours under the $1.25 minimum bill. This practically gives the consumer the same amount of current he had before for the $1.25 minimum bill and gives him 10 kw-hours additional for 50 cents. Current consumed over and above 20 kw-hours is billed at the regular rate. If the plan works out to encourage porch lighting and similar long-hour business, it is undoubtedly good, but consumers may use the extra 10 kw-hours for peak-load lighting inside the house rather than for long-hour porch lighting.

Power Business Not Wanted.

The following ordinance, recently passed by the Council of an Illinois city which maintains a municipal lighting plant, is illuminative as to the lack of breadth shown in the management of many such plants in this country, and in striking contrast to the general policy of municipal plants in Great Britain, many of which vie with American private plants in vigorous "new business" methods. It will be noted that the consumer is required to furnish his own meter, is not allowed any discount for large use of electrical energy, and is subject to fine for use outside of specified hours:

"Current for power purposes may be taken through any meter installed for measuring current for lighting, provided that the motor used by any such consumer does not exceed 1 hp in efficiency. Current so taken and measured shall be paid for at the same rate as current for such lighting. Where and when the motor so used exceeds 1 hp the current so taken shall be measured by a separate meter installed for that purpose by said consumer, and the charge therefor shall be, and the same is, hereby established at 10 cents per kilowatt hour, provided that the minimum charge for the current thus used and taken shall be $1 per month, and no discount shall be allowed upon the bills rendered for current thus used.

"Current for power purposes shall only be used or taken during the months from May to October, both inclusive, between

the hours of 7 a. m. and 6 p. m., and during the remainder of the year between the hours of 8 a. m. and 4 p. m.

"And whoever uses current for power purposes during any other hour or hours shall be subject to a fine of not less than $5 nor more than $25 for each offense."

Special Festoon Street Lighting at Laurium, Mich.

At Laurium, Mich., a part of Calumet, the Houghton County Lighting Company has a contract for lighting the streets of the business district with festoons of incandescent lamps hung along each side of the street from pole to pole along the curb line. At the principal business corner these festoons also extend diagonally across the street to form a cross. These lamps are turned on and off by an Anderson time switch set to turn the lamps on at dusk and to turn them off two hours later. The cost to the merchants averages from 2.5 to 3 cents per front foot. No uniform rule is pursued in assessing the different merchants, as the larger and more prosperous classes of business pay more than the smaller ones. The cost runs from $1.50 to 75 cents for each merchant.

Valuation of Lighting Systems.

The present discussion of the valuation of lighting systems recalls the comments on the subject by Mr. George R. Carson in his presidential address before the Iowa Electrical Association.

Most of the severe critics of public utility corporations are, he said, landowners who have taken the position that only the cost of duplication of the corporate property should be capitalized, neglecting consideration of the cost of getting the business, as well as the costs entailed by the many changes necessary in its growth to the present time. To apply this same principle to their land would place a value of $1.50 an acre, the price paid the government, instead of perhaps $125, the present value. The same comparative increases of values can be shown on city real estate, yet both are earning good rates of interest on present high values.

The land interests are, in fact, the greatest public servants we have, and raising or lowering their values will cause a corresponding increase or decrease in the cost of living. We remember the cost of food products 20 years ago, when land was about one-third its present value; yet freights, electricity, gas and water were much higher then than to-day. Higher cost of food and rentals caused higher cost of labor, so that the rise in land values is the greater reason for the increased cost of living, and not the corporations, as the people have been led to believe. One can imagine the remonstrance there would be if laws were enacted placing values of foods at about one-half their present worth and a corresponding reduction made in all rental of buildings and homes, yet this would only duplicate some of the measures urged against corporations.

Large Electric Signs in Seattle.

The Standard Furniture Company, Seattle Wash., claims to have the largest electrical sign of its class west of Chicago. The sign consists of four sections, three of which bear the name of the company, and are visible from all parts of the city, West Seattle, across the bay, and from all parts of Elliott Bay. The signs are arranged in a triangle on the top of the nine-story building, 115 ft. above the ground. The two signs facing Pine Street and Second Avenue are each 113 ft. long, with letters 6 ft. high, burning 332 4-cp incandescent lamps. The third side of the triangle is 112 ft. long, 6 ft. high and has 332 lamps. The total linear length of these signs is 338 ft.

Between the two firm-name signs is a trade-mark circle, 18 ft. in diameter and illuminated by 198 4-cp lamps in the 16 letters displaying the company's advertising motto, "Your Credit Is Good." The sign is supported by iron angles and tees firmly connected to the construction work of the building, being set into the concrete roof with stud bolts. The first cost was

FIG. 1.—ELECTRIC SIGN IN SEATTLE.

$2,000. The sign burns three hours in summer and four and one-half in winter.

The 240-ft. electrical sign of the Seattle Hardware Company on First Avenue South and King Street, is claimed to be the longest continuous electrical sign west of Chicago. Mounted on top of the company's seven-story building it is visible from all parts of the city and Elliott Bay. The sign is 7 ft. high and stands about a foot above the top of the fire wall of the build-

FIG. 2.—ELECTRIC SIGN IN SEATTLE.

ing. The letters are made of sheet metal extending forward so as to cover the lamp bulbs and act as a reflector to throw the light forward. The receptacles are protected from the rain and weather by a covering of sheet metal. It is supported on the

back by 1½-in. x 1½-in. and 1¾-in. x 1¾-in. tee and angle irons, which are fastened to the roof with stud bolts set in cement.

The sign, "Seattle Hardware Co.," contains 17 letters which are illuminated by 320 4-cp lamps. Each letter is wired separately and then grouped together in multiple. There are five circuits protected by regulation enclosed fuses. The sign takes

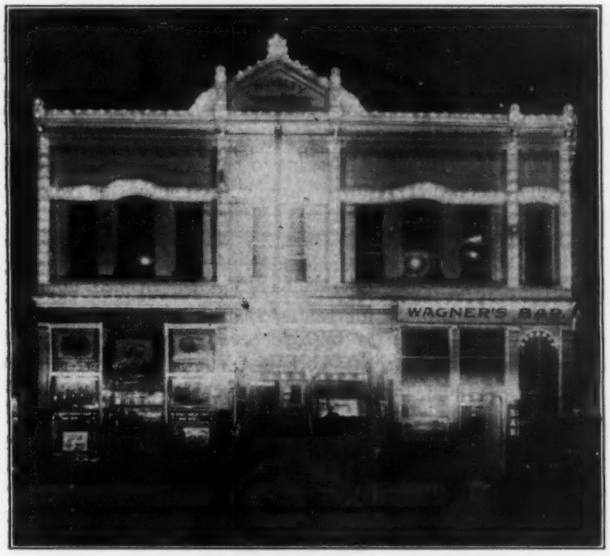


FIG. 1.—DENVER THEATER BEFORE CHANGE.

approximately 40 amp at 110 volts, or 4.4 kw. The sign burns about five hours, from 6 to 11 o'clock.

Both these signs are on the alternating-current, city-lighting system on the same flat rate as the lights in the building. They are never turned on while the buildings are lighted. Maximum-

FIG. 2.—2,040 LAMPS ON DENVER THEATER FRONT.

demand meters are used to get the maximum current consumption. Neither sign takes as much current as the total lights in the buildings, so that the cost of operation is the kw-hour consumption at the flat-rate lighting rate.

"Burning Up" a Theater Front.

The accompanying views of the Cameraphone Theater, in Denver, before and after a recent increase in the number of lamps on the front of the building, show the general tendency to increase the amount of display illumination on places of this kind. This theater now has 2050 lamps of 4 cp and 8 cp on the front of the building and in the foyer. This includes the lamps on the numerous electric signs. Those used in the signs and for the outlining of the building are 4 cp, while those in the foyer are 8 cp. This building has a 75-ft. front, which is painted white to aid the spectacular night effect. The photograph, Fig. 2, hardly makes plain the large number of lamps used in some places. The stars, for example, are almost solid masses of light, having the lamps placed as thick as they can stand. In the foyer some of the ceiling effects are very striking.

Progress in Electric Heating.

BY H. W. HILLMAN.

Some time ago I wrote about the progress in electric heating in Grand Rapids, particularly referring to electric radiators and grates. Marked progress has also been made in connection with electric ovens for industrial purposes. For many years the Fox Typewriter Company, of this city, had used gas ovens

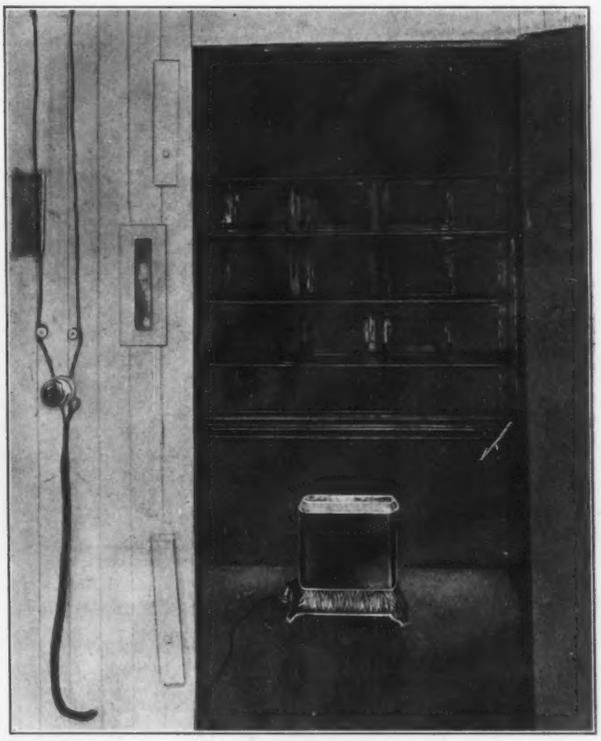


FIG. 1.—INTERIOR VIEW OF ELECTRIC OVEN.

for baking the enamel on typewriter parts. Steam power was used to operate the factory. But a year and a half ago the steam plant was abandoned and electric power was purchased from the power company. At this time the disadvantages of the gas ovens were emphasized particularly when compared with the possibility of using an electric oven. It was believed that in all respects, with the possible exception of cost, an oven operated by electricity was far superior. The gas ovens produced so much smoke and dirt as to be extremely offensive. It was necessary to have a so-called oven room to confine the odors and smoke in one section of the factory. This arrangement required that all parts in process of production be transported to that room for baking and drying.

There was no question whatever about the great desirability

of the electric oven for such work, but, as usual, the high cost of operation was greatly feared. It was decided to install two standard electric heaters of 2-kw capacity each in one of the gas ovens and make a test regarding cost of operating.

During the test considerable anxiety was exhibited about the competition with gas at 60 cents per 1000 ft. and there was a general feeling that electricity could not be used unless the rate should be made even lower than the power rate. However, the test continued, and all-night runs were made with the electric oven alongside the gas oven. Current and gas were turned on at the same time. The oven, when operated electrically, introduced a principle of great economy and value, which had not heretofore been considered. It was capable of operation in a practically air-tight condition. After bringing up the temperature to the desired point, the current could be switched off and the heat would remain and continue to do work for hours without current. In fact, two hours' use of current, between 4 and 6 in the afternoon, was sufficient for an all-night run. The same principle of storing heat in the gas oven could not be used, because a chimney was necessary for the emission of odors and smoke, and the heat escaped from the chimney. It was shown that at 60 cents per thousand, an all-night run by gas cost approximately 70 cents. At the regular power rates of 1¾ cents per hp-hour, which the Fox Typewriter Company earns in connection with its factory power, an all-night run for the electric oven cost 17 cents. It other words, gas, even at 60 cents per thousand, was four times more expensive than current billed at the regular published rate of the power company.

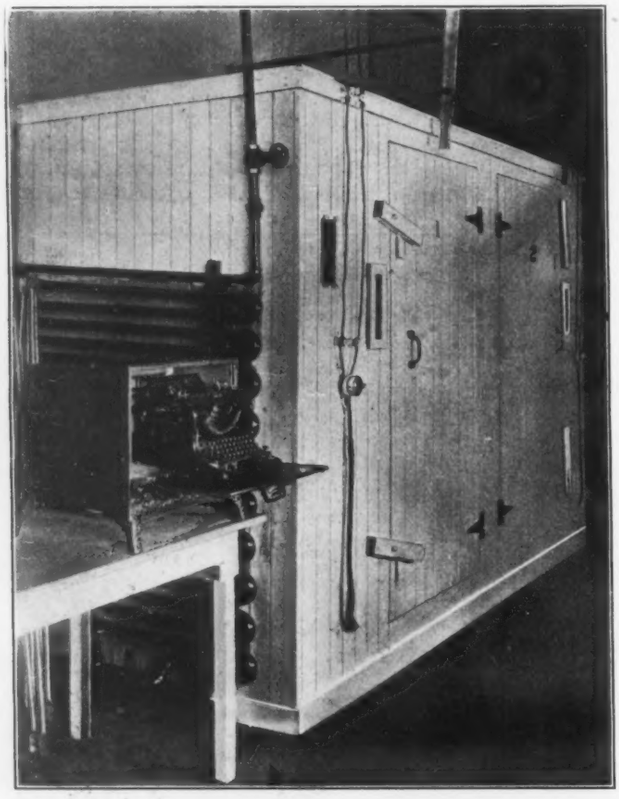


FIG. 2.—EXTERIOR OF ELECTRIC OVEN.

There are other features regarding the cost which are important from the standpoint of production. With gas ovens all the parts are transported from the different departments to the oven room, and this system was absolutely necessary. With the electric system smaller-sized ovens can be located in the different parts of the factory adjacent to production departments. Then the operating cost of drying and baking by electricity will be still further reduced.

The following extract from a personal letter to the writer from Mr. Fox refers to the commercial use of an electric oven for replacing an old-type steam oven:

"We have for a number of years used steam for heating our varnish ovens and have always been troubled with specks of dust on the work, caused by dust accumulating on the steam pipes and rising with the heated air and finally lodging upon the work. We only overcame this by lining our ovens with tin, lock joint and soldered, so that they can be wiped out each day with a damp cloth. Then, to avoid the possibility of dust accumulating on steam pipes, we installed one of your 2-amp heating units, the whole equipment being what you might call antiseptic so far as dust is concerned, the portability of the heater being a factor in this case as it can be removed entirely from the ovens, enabling the ovens to be thoroughly freed from dust and the heater returned to the oven after the work is put in.

"Our ovens are not large, about 5 ft. x 5 ft. x 6 ft. high. We load these with the varnished work, turn on the current and in about two hours' time we have 140 deg. of heat, which is the proper temperature for baking varnish. We then turn off the current and allow the oven to cool down. As soon as it cools down to 100 deg. the work is taken out and we have a fine finish without the annoyance from dust particles which we previously experienced.

"We are so well pleased with the success we have had in baking varnish by electricity that we are preparing drawings for ovens to be used for baking our enamel in the same way, as we consider there is as much to be gained in baking enamel by electricity as there is in the baking of varnish."

FIG. 3.—FIRELESS COOKER.

Each and every month since last fall the power company has rendered a bill to the Fox company for heating, as well as lighting and power, which bill has never been questioned and is considered entirely satisfactory.

DEVELOPMENT OF A NEW FIRELESS COOKER.

The same principle of retaining heat is being adopted in the design of various fireless cookers, so many of which are now being manufactured and sold. As Grand Rapids is a great wood-working community a fireless cooker factory is naturally located here, and the business which this factory handles suggests the necessity of electric-lighting companies watching this development. The cost of cooking and baking by electricity can be cut in half by the use of the fireless cooker.

The Caloric cooker, made in Grand Rapids, differs somewhat in design from all other types. Each compartment is not only thoroughly insulated for retaining heat, but is also equipped with a removable steatite, or soapstone, which may be removed and heated on a coal, gas or electric range or alcohol stove. After heating for 15 minutes it is placed again in the cooker

compartment and will retain the heat absorbed for many hours. In this respect it has a keen advantage over old-style cookers which accomplished cooking by heating the food first and then retaining the heat from the food in the cooker. It was the first fireless cooker to be designed with a baking oven. The previous designs, for boiling only, were popular, and many thousands of them sold, but upon the introduction of the combination device, with baking oven and boiling compartments, the older styles have been abandoned in favor of the complete outfit.

The writer had two small 3-lb. flatiron units, 300 watts each, placed in a steatite, or soapstone slab, and wired the caloric electrically. This electric cooking and baking outfit consumed only 600 watts and could be operated on any lighting circuit. A 5-lb. roast of beef was well cooked in three and a half hours with 45 minutes' use of 600 watts of current. A pot of beans was baked over night with 45 minutes' use of 600 watts of current. Such operations were accomplished at one-fifth of the cost of roasting and baking with electric ovens the writer has used during the past six years.

The design not only permits of very economical operation, but it possesses a keen advantage in the consumption of only 600 watts, its ability to be attached to any lighting circuit, and,

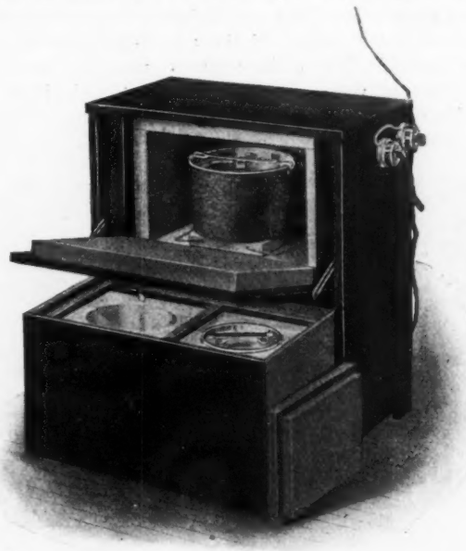


FIG. 4.—FIRELESS COOKER.

further, is capable of *baking* all kinds of food, as well as boiling foods.

The electric cooking and baking outfits which have been marketed in the past few years have been confined mostly to small families and every effort made to eliminate unnecessary devices, to reduce the initial cost and to cut down the kilowatt demand of the outfit to a minimum. The "Caloric" electric outfit is designed for use in a small family for light housekeeping. Its initial cost is cut in half compared with electric outfits previously sold. With the so-called lighting socket feature, it represents, in my judgment, marked progress in electric cooking and baking. For certain purposes the design is also suitable for hotels, clubs and residences, and larger sizes of outfits could easily be designed. The general principle should be extensively used, and will be, when the electric manufacturers and operating companies fully appreciate its advantages.

Exhaustive tests have been made in connection with fire risk, and the "Caloric" Fireless Cook Stove Company expects soon to produce such electric outfits which will be fireproof and possess the advantages enumerated above. To date, however, this design has simply been experimental and under development.

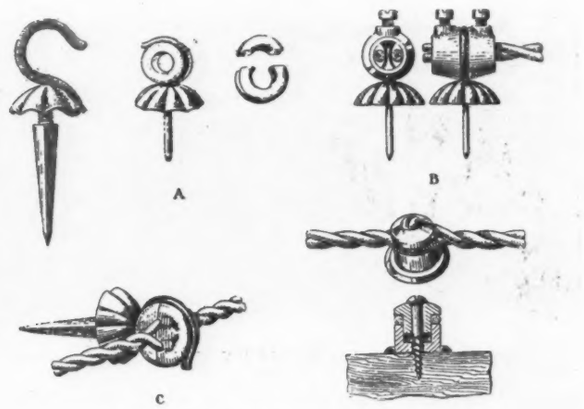
Therefore, there is every reason to feel that progress is continually being made in connection with the subject of electric heating, not only by the extensive use of a great many miscellaneous devices commonly known and exploited by electric companies, but also progress is being made along lines of electric heating, cooking and baking which have not heretofore appeared especially encouraging.

INTERIOR WIRING AND ILLUMINATION

Peschel System of Interior Wiring.

In Germany, interior wiring practice differs greatly from that in this country. The current density permissible is much higher and the insulation thinner than allowed in this country. On the other hand, wooden molding is forbidden and cleats cannot be used except on properly grounded cables. Insulated wires must be installed either as open work on suitable insulators or placed in conduit; and all wiring is done so that it can be easily replaced in the future.

The Peschel system, which is claimed to be cheaper than wooden molding and to incur less risk of fire, was introduced 15 years ago. At first the conductors were hung in a series of loops from ring insulators, consisting of grooved porcelain or glass rings, either in one piece or split, sprung into small spring hooks furnished with either nails, screws



A GERMAN SYSTEM OF INTERIOR WIRING.

or eyes, as shown herewith in *A*. To keep the wires taut a special clamp insulator, as shown at *B*, is used. This consists of a short porcelain tube in which the flexible wires are held fast by two screws forced down between two fiber strips, which wedge the cord against the tube. Another form of grip is shown at *C*. A form very much used is shown at *D*. On tightening up the screw or nail, one part of the insulator telescopes into the other, gripping the cord between the edges. The usual method is to fix the insulators at intervals in the flexible cord before erecting, when the wires may be fastened to the walls with great rapidity. A somewhat similar insulator in one piece is used in this country for telephone twisted pairs.

The German specifications for wires are as follows: Rubber-insulated flexible cords are suitable for fixed wiring up to tensions of 1000 volts, and for connecting up portable energy-consuming devices up to 500 volts. Flexible cords may be used having a cross-section of from 1 to 6 sq. mm. The conductor to consist of tinned copper wires (not exceeding 3 mm. total diameter) twisted together, spun over with cotton, and then covered with a watertight sheath of vulcanized rubber.

Each conductor must be protected by a covering of yarn, silk or cotton. With either single or multiple-conductor flexible cord this must be in the form of braiding. Round or oval multiple cords must receive an additional covering over all.

Each conductor, after immersion in water for 24 hours, must

withstand a pressure of 2,000 volts, and must be tested for half an hour at a temperature not exceeding 25 deg. C. The thickness of the insulation is to be in accordance with the following table:

Maximum allowable Current Density.	Cross-Section.	Minimum Insulation Thickness.	Maximum Insulation Thickness.
11 amp.....	1 sq. mm.	.8 mm.	1.1 mm.
14 "	1.5 "	.8 "	1.1 "
20 "	2.5 "	1.0 "	1.4 "
25 "	4.0 "	1.0 "	1.4 "
31 "	6.0 "	1.0 "	1.4 "

The installation regulations state that fixed wires must be protected by their own covering, or by their position, against mechanical injury. Portable and flexible conductors when branched from fixed wires require special protection only when they are exposed to rough handling.

Founder's Week in Philadelphia.

The most notable celebration ever held in Philadelphia, which occurred from Oct. 4 to 10, designated as Founder's Week, was inaugurated with the electric lighting of the City Hall and ended with the official extinguishing of the illumination of this building one week later. The whole of the week was devoted to public exercises in which various military, municipal, industrial, naval, historical and athletic organizations took part.

A special feature of the week was the decoration and illumination of the buildings along the main routes of travel. Prominent among the buildings utilized for decorative illumination was the office of the Philadelphia Electric Company, which

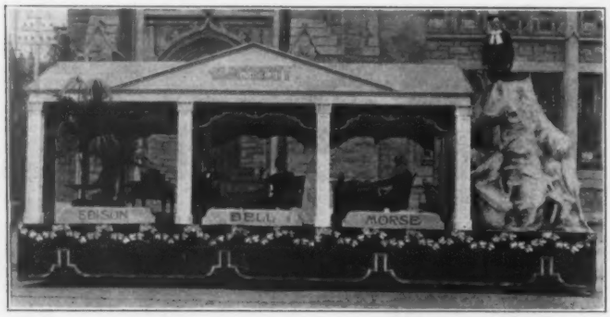


FIG. 1.—ELECTRICITY FLOAT.

during the evening hours presented a brilliant display with its superabundance of interior lighting and its special streamers of incandescent lamps arranged along the exterior. Two flags built of lamps, arranged to show both the local and the national colors, seemed to be flying in the wind by reason of the "flasher" used in the lamp circuits. Mention should also be made of the building of the *Evening Bulletin*, which appeared to be filled to overflowing with light from mercury-vapor lamps.

Beyond doubt the most striking element in the illumination during Founder's Week was that provided for the City Hall. The magnitude of the undertaking in connection with the special illumination will be appreciated when it is learned that there was actually installed for this purpose temporary substation equipment aggregating 1000 kw in rating. A remarkable fact connected with this equipment is that all of the apparatus was installed and placed in service within 24 hours. Instead of employing direct-current, which would have necessitated the use of a large amount of conducting material which would have been damaged greatly by installation and removal, the Philadelphia Electric Company made use of air-blast transformers for obtaining energy at 6000 volts and distributing it to intermediate bus-circuits at 2000 volts. Numerous standard 2000 volt oil-insulated lighting transformers served for supplying energy at the proper e.m.f. for the various lamp circuits around the building. All of the material employed was obtained from stock, and with the exception of short lengths of cable, will be equally as valuable after removal as before installation.

The lighting equipment of the City Hall was designed and installed by the Electrical Bureau of the city, under the direction of Chief McLaughlin. The magnitude of the equipment is shown by the fact that no local contractor would undertake

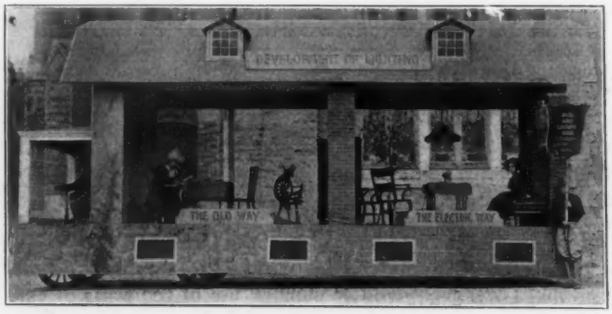


FIG. 2.—ELECTRIC LIGHTING FLOAT.

to install the four special pieces, each of which weighed several tons. Each of these pieces showed a mammoth figure of Father Penn, and contained the dates "1683" and "1908," together with the word "Greeting." The two facing Broad Street entrances were somewhat more elaborate than the two facing Market Street, and contained the additional wording, "Philadelphia Maneto." The eight columns supporting each corner of the building were completely covered with incandescent lamps, there being nearly 600 lamps per column. Over these columns were placed shields worked in colored lamps displaying

FIG. 3.—ELECTRIC LAUNDRY FLOAT.

the anniversary numeral 225. Along each side of the building were placed almost 100 U. S. flags, the staff of each of which carried three incandescent lamps. Along the roof were arranged waving flags of electric lamps similar to those employed by the Philadelphia Electric Company, while certain of the architectural features of the roof were outlined with incandescent lamps.

Although the larger portion of the special illumination was

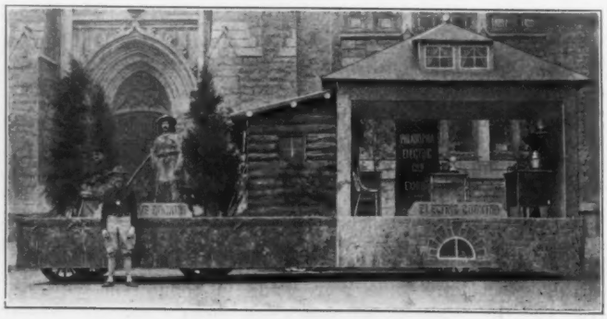


FIG. 4.—ELECTRIC KITCHEN FLOAT.

obtained from incandescent lamps, arc lamps were employed to advantage in directing the eye to the statute of William Penn, which occupies the highest point on the City Hall tower. The statute itself as well as the paintings of Penn referred

to above were directly illuminated by beams from search lanterns located on adjacent buildings.

A lighting equipment which will hereafter form a permanent part of the City Hall decorations, but was placed in service for the first time in connection with the Founder's Week celebration, is a series of elaborate street lighting fixtures which completely encircle the building. There are 28 lamp posts, each of which represents a certain district that has been included

FIG. 5.—ELECTRIC MACHINE SHOP FLOAT.

in the City of Philadelphia. Each post contains first a circle of 12 enclosed incandescent lamp-units, then a circle of 9 units, a circle of 6 units and topped with a single unit. The two posts on each side of each entrance contain, in addition, two lamp-units which are placed nearer the street, the former unit being at the top of the posts.

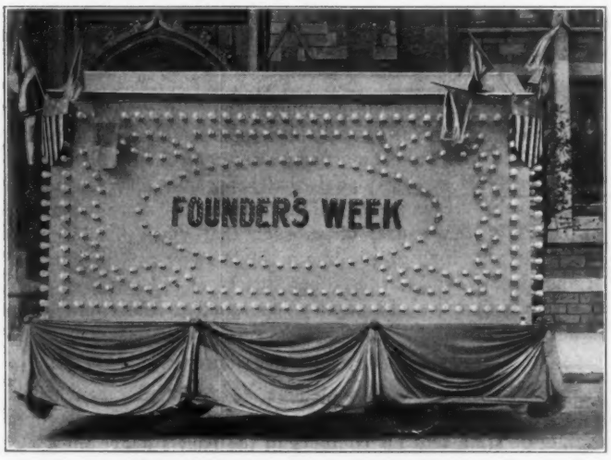


FIG. 6.—ELECTRIC SIGN FLOAT.

The decorative and permanent lighting of the City Hall harmonized to produce an effect both dignified and impressive and well in sympathy with the Founder's Week celebration.

Wednesday, Oct. 7, was designated as Industrial Day, which witnessed a remarkable parade of almost 200 floats showing the birth and development of Philadelphia's industries.

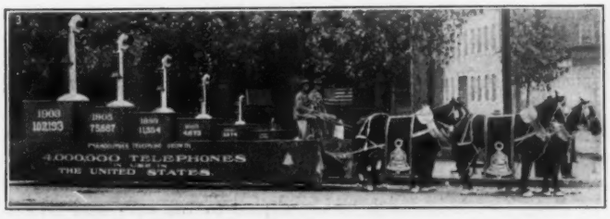


FIG. 7.—FLOAT REPRESENTING GROWTH OF TELEPHONE INDUSTRY.

Among the notable floats, mention should be made of those entered by the Philadelphia Electric Company, which provided an interesting and instructive exhibit. The leading element of the exhibit was an elaborate banner carried by relays of men dressed in linemen's clothes. Following the banner were electrically-driven floats representing the progress of civilization as exemplified in the electrical industry. A colonial residence with its inconveniences was shown in contrast with a modern house fully equipped with electrical appliances. One float carried two laundries in operation, one being of the ancient negro variety and the other of the up-to-date electrical type. An old-time kitchen, with its smoky pots, was contrasted with an attractive room containing electrical cooking devices in service. A steam engine-driven machine shop, with its full

FIG. 8.—FLOAT OF BELL TELEPHONE MAP.

array of belts and the accompanying dirt, served to emphasize the cleanliness and compactness of a modern motor-driven machine shop. An especially striking float was one containing living representations of Edison, Bell, Morse and Franklin using their inventions. All of these floats were carried on the company's lamp wagons, extra storage batteries being provided for operating the electrical devices. One of the electric wagons was completely covered by a frame over which was stretched blue and yellow cloth, the colors of the city. Over this entire frame were studded, in neatly worked-out designs, various types of electric lamps. In the center, on both sides, the words "Founder's Week" were spelled out in miniature electric lamps, and on the back of the wagon the Philadelphia Electric Company's monogram was shown in miniature lamps. The wording "Founder's Week" and the monogram were illuminated from time to time by means of a flasher, the result being very effective.

The Bell Telephone Company exhibited three floats. On one of these were shown what were stated to be the largest maps in the world, showing the routes of the Bell system throughout the United States. A miniature telephone system in actual operation connected points on the float. Early overhead systems and modern conduit systems of telephone inter-communication were strikingly compared on a special float devoted to this purpose. The growth of the telephone industry in Philadelphia was illustrated by the comparative sizes of six telephones from 1 ft. to 8 ft. in height, showing the increase from 2100 telephones in 1883 to 102,000 in 1908.

One of the largest and most elaborate floats was the exhibit of the Keystone Telephone Company. This float, which was

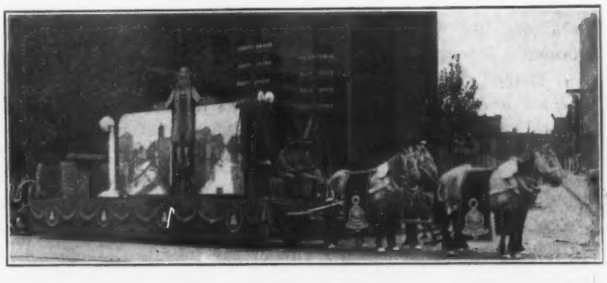


FIG. 9.—FLOAT OF BELL TELEPHONE SYSTEM.

drawn by 20 horses, contained eight separate rooms in each of which a special modern application of the telephone was shown. These rooms were devoted to the following subjects: Fire department signal room, department store, banker's office, lawyer's office, factory, bed room, police station, and broker's office. Along the top of the float were arranged the portraits of

telephone inventors Reis, Gray, Edison, Berliner, Blake and Cushman. An entertaining novelty was introduced in the form of telephone bells (tubes) perfectly tuned to cover two full octaves on the musical scale. The telephone operator was able to render certain selections by manipulating a set of ringing keys. The various rooms were connected electrically to a telephone central, and actual telephonic intercommunication was conducted while the float was in motion.

Among the transportation floats was a large one entered by the Philadelphia Rapid Transit Company, showing a section of

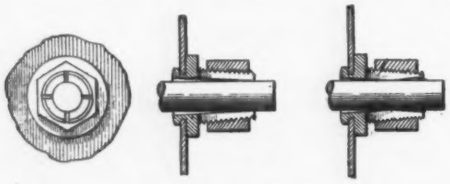
FIG. 10.—FLOAT OF KEYSTONE TELEPHONE COMPANY.

the Market Street subway with electric cars in place. A glance into the future was given in the form of a section of the proposed tube to connect Philadelphia and Camden which occupied a special float in the parade. The J. G. Brill Company exhibited two floats, one of which carried a car that was in service 30 years ago and the other the latest type of pay-as-you-enter car manufactured.

New Telephone Patents.

IMPROVED TRANSMITTER.

In almost all modern transmitters, the movable electrode is made integral with or is securely attached to the diaphragm. In the latter case a screw or a stud passes through the diaphragm, and it will be readily apparent that unless all parts register correctly there will be an initial buckling of the diaphragm.



ALBRIGHT TRANSMITTER.

To avoid this, Mr. H. F. Albright, of Elizabeth, N. J., has obtained a patent for a transmitter in which the clamping device is so shaped that its contact with the stud of the electrode is upon a line only. The illustration shows the idea, and the conical bore of the clamping sleeve. The patent has been assigned to the Western Electric Company.

Mr. F. F. Strong, of Boston, Mass., has patented a pocket type telephone in which both transmitter and receiver parts are in one casing. The mouthpiece for transmission has behind it a receiving cap from which a rubber ear tube leads. The user directs his voice toward the mouthpiece, and listens at the tube. The tube does not interfere with the sound, as the receiving cap and mouthpiece are so designed and placed that there is an annular slit all around to admit sound to the casing.

Another instrument of this combined type has been patented by Mr. F. W. Wood, of Newport News, Va., which is especially designed for shipboard use. The set is waterproof and semi-flexible, metal-encased tubes extend to the ears, while the instrument rests upon the breast of the user. The ear tubes are arranged so that when in operative position the hook switch mechanism is properly shifted.

SUBSTATION DEVICES.

Mr. M. M. Kahn, of Louisville, Ky., has patented a receiver holder. This is adapted to be attached to the transmitter arm or desk stand. It is provided with all necessary adjustments for holding the receiver in the desired position. This support has no attachments to the hook switch and is only for use when conversation takes place.

With rural lines at times a number of radiating branches come together at one point. If there be a station at this point, and if a switch be used to cut off any one branch with which it is desired to converse, the rest of the line may be left free for use by others. Mr. V. E. Greene, of Galva, Ill., has patented a switch for this purpose. The switch partakes of the nature of a gong strap switch.

SWITCHBOARD SYSTEMS.

As a semi-automatic system, Mr. A. H. Dyson, of Chicago, has combined the ordinary manual system and the usual automatic system. It is found that this combination works out readily into a complete system. The lines terminate at the exchange at a manual board in the usual line signal apparatus, and also upon the terminal surface of a series of automatic instruments. At the manual switchboard groups of outgoing trunks, so to speak, are arranged to feed groups of lines of 100 each, these lines terminating in the multiple of the trunk connectors. When a call is received by an operator, in the manner usual for manual exchanges, she completes the connection to a free outgoing trunk, and then, with a dial or sending device, she sends an automatic call for the desired party. Mr. Dyson has assigned his patent for this system to M. G. Kellogg, of Chicago.

Mr. E. Tanke, of Berlin, Germany, has been granted a patent for the circuit system of a divided type switchboard, in which it is desired that the calling party may control in whichever of two places his calling signal shall appear. The scheme involves push buttons at the calling station and an arrangement of relays at the central office, such that when the circuit is closed for one limb of the line a single relay acts to light one of the signals, while if the other side be closed this first relay, together with a switching relay, operates to cause the second signal only to light.

CALL REGISTERING ARRANGEMENT.

Mr. C. E. Wilson, of Philadelphia, has patented a switchboard especially arranged to facilitate the registering of calls upon counters. He places his counters in the panels above the jacks, and the pushes or other operating devices are spaced in the panel to accord exactly with the answering jack arrangement, and each corresponding jack and counter position represents the same line. It will be seen that the operator required to register calls can most readily find the proper counter because of this correspondence of position. The Keystone Telephone Company has been assigned this patent.

TRANSMITTER CUT-OUT.

The extraneous noises picked up by a transmitter at times become so troublesome that it becomes essential to suppress them. This may be accomplished by short-circuiting the transmitter during the listening periods. An attachment for accomplishing this short-circuiting handily forms the subject of a patent granted to H. S. Gilbert and W. F. Drake, of Pueblo, Colo. A two-conductor cord is run from the transmitter to the receiver. At the latter it terminates upon a special form of strap switch in reach of the thumb of the user and secured to the cap piece of the receiver. At the transmitter one strand secures to the casing and one has a special clip for grasping the regular transmitter cord tip as it projects from its bushing.

PARTY LINE SYSTEM.

A step-by-step party line system has been invented by H. O. Rugh, of Sandwich, Ill. The line is controlled from a central station, and the talking and signaling circuits are kept separate throughout. The signaling circuit is a series one looping

through each station. Short impulses step-up the selectors, a steady current maintains the set, and the cessation of current after a steady current permits the withdrawal of all falls and the return of all stations to normal.

Letters to the Editors.

How to Work a Patent in England.

To the Editors of Electrical World:

Sirs:—Being affected by the new British patent law, I read with much interest in your issue of Oct. 10 the contribution, "The Recent Change in British Patent Law," by an English barrister.

The article states that "the percentage of patents issued to foreigners in Great Britain, United States and Germany was as follows: Great Britain, 44.2 per cent; United States, 10.9 per cent; Germany, 34.9 per cent." It is understood that under Great Britain all the colonies are included.

Considering that the percentage of applications for patents is always greater from the United Kingdom and the colonies than from foreign countries, while the applications of the latter are practically exclusively for inventions of great importance, the data given apparently substantiates the fact that Great Britain lags behind in inventive genius the two countries named and particularly Germany.

The article goes further in proving my assumption: "British subjects (including British colonies) received from America 1622 patents and from Germany 883. It will thus be seen that the British government has been in the habit of issuing more patents to American and German inventors than the authorities of either of these countries are of issuing to people domiciled in England." This is but natural, as assumed above; but can it be possible that the British government has a "habit" of granting more patents to foreigners than the cases presented warrant?

It is not surprising that British subjects receive but half as many patents in Germany as American inventors. In connection with this point, allow me to call attention to a correspondence in the Electrical World of about a year ago, in which it was shown that the German government pointed out that it granted more patents to American inventors than to German subjects.

Huge figures have been offered by British authorities (one being £600,000,000) regarding the losses due to the assumed inefficiency of the old patent law, but no figures are given as to what the future losses will be. Such losses are difficult to estimate, but it is certain that, due to the new patent law, Great Britain will be a heavy loser in the long run.

The English barrister states that already a number of German concerns have acquired or are about to acquire land in Great Britain for factories. But these factories will employ, as far as possible, German artisans. German ways and methods will be adopted and thus Germany will invade England on a much larger scale than it has done heretofore in simply selling there its products.

It will be remembered that, some dozen years ago, in order to check the sale of products from a certain country Great Britain enacted a law to the effect that such products must bear the label "Made in Germany." The effect was contrary to that expected by English authorities, as Germany sold more goods than previously. A similar, but more extensive, "check" was recently enacted and will soon come into effect, namely, that all products from foreign countries must bear the label "Made in foreign country."

An article entitled "How to Work a Patent in England" by an English barrister-at-law appeared in the Electrical World of Aug. 15, 1908, and its title should be well kept in mind by every inventor, particularly those of America and Germany, to whose interests the new patent law is supposed to be detrimental. The inventor who cannot afford to have his ideas exploited in the United Kingdom without running the risk of having his mental property pirated by a bystander, will probably do better by boycotting the English Patent Office.

At present, there is much agitation on the continent of Europe regarding the stand taken by England, and it is hoped that America will also make plans to protect the mental property of her inventors.

New York. Frank Koester.

The Measurement of the Illumination of Streets.

To the Editors of Electrical World:

Sirs:—In your report of my presidential address at Philadelphia last week I note that there is a chance for misunderstanding which I wish here to remove. I laid considerable stress on the shortcomings of illumination measurements on the street normal to the ray, but I do not thereby wish to be understood as implying that from a technical standpoint this direction of measurement is necessarily improper. There is abundant room for argument as to the direction of measurement which most precisely represents the usefulness of the illumination. The experimental data are meager and inconclusive, and in my opinion tend to show that no single direction is fully representative. What I did wish to condemn, however, was the use of the normal measurement as a sort of apology for bad lighting. The normal measurement gives the highest apparent figure that can possibly attach to the lamp and distance. To reach the same apparent value by measurement in any other direction at a given distance requires more light and, under most conditions, very much more. The common English plan of measuring the horizontal component implies for the same nominal minimum a much better lighted street. Suppose, for example, one takes 0.1 foot-candle as the minimum illumination between lamps, and undertakes to derive it from arcs placed in common American fashion, say, 20 ft. high and 240 ft. apart. Then at the middle point, taking in the ordinary way the nominal illumination from one lamp, it is evident that the source must be of approximately 1500 cp in the direction of the ray.

Taking now the projected value of the illumination at 0.1 foot-candle and taking this value at the pavement and as received from both adjacent lamps instead of one only, the required candle-power per source rises to about 4500. On the second plan, the lights being similar, the street would receive practically three times the flux of light. In other words, a change from the projected measurement to the normal measurement would cut down the actual light on the street to one-third of its former value, assuming a given minimum. Actually the change might be even greater, since the English custom refers the projected value to a plane 4 ft. above the pavement.

So while there is no vital objection to a measurement on the normal *per se*, it must be remembered that if this is to be taken as standard, the minimum must, to secure first-class lighting, be taken very much higher than is now usual. In foreign practice it is not uncommon to find arcs spaced at about four times the heights of the lamps above the pavement. At this distance the difference between the results by the two methods—that is, one lamp on the normal or the pair projected—practically vanishes, so that the issue abroad is not at all a vital one.

Another weighty consideration is that with some of the most important recent illuminants, it is easy by the use of suitable glassware or otherwise so to modify the distribution that a large proportion of the light shall be sent out near the horizontal. This device has legitimate uses, but it does not tend to the production of a brilliantly lighted street, unless the minimum is placed high, and especially high if as a matter of convenience the measurement is to be made on the normal. To get really good street lighting we need not only efficient sources and judicious distribution, but a good deal more energy than is now customarily allowed.

The common minimum of 0.02 or 0.03 foot-candle seems to have been based on an assumed value of moonlight. Now, moonlight in these latitudes under ordinary sky conditions is of very deceptive value. Owing to its diffusion and to the low intrinsic brilliancy of the source, it is of much more visual

usefulness than illumination of the same measured intensity derived from the brilliant visible sources commonly employed. Hence, the minimum of illumination from such sources should be placed at a value very considerably greater than full moonlight to get good lighting; and if we are inclined to measure on the normal, a large further increase must be made. All these considerations point to a radical revision of street lighting specifications in the direction of more light. With the high efficiency illuminants now available, a very great change for the better can be made and ought to be made. But even with their help a more liberal allowance of energy per mile of street is of the first importance. Central station men have been severely handicapped in producing results by illiberal policies on the part of municipalities. If these could realize how badly their streets are of necessity lighted with the appropriations available, they would very generally start on a course of improvement. It is time to stop juggling with technical data in the vain attempt to make one kilowatt ostensibly do the work of two or three. The thing to do is to set up the proper standard of street lighting, apply to it the best available methods, and then to put the burden of falling below that standard where it belongs. If a community is satisfied with poor lighting, so be it; but let there be no self-deception about the matter.

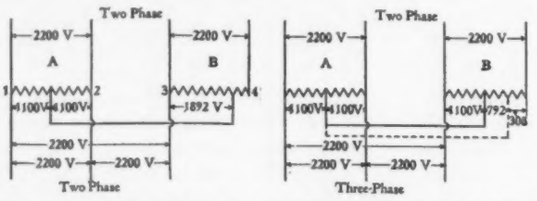
Boston, Mass. Louis Bell.

DIGEST OF CURRENT ELECTRICAL LITERATURE

Abstracts of the important articles appearing in the electrical periodical press of the world

Generators, Motors and Transformers.

Auto-Transformers for Changing Polyphase Currents.—An illustrated article on the use of auto-transformers for changing the number of phases in a polyphase system. If it is desired to supply three-phase energy at 2200 volts from a two-phase, 2200-volt generating station, two auto-transformers may be used provided the two-phase generators are of the type with no connection between the two armature windings. Two ordinary transformers of the two-coil type, having a ratio of 1-to-1, can of course be used for this purpose regardless of the type of generator windings. The method of connecting the auto-transformers is shown in Fig. 1. This method is efficient and much less expensive than the use of two-coil transformers. At the middle point of transformer *A*, a connection is made to an 86 per cent tap on the transformer *B*. This interconnects the two-



FIGS. 1 AND 2.—DIAGRAMS OF AUTO-TRANSFORMER CONNECTIONS.

phase windings so that three-phase energy may be obtained by connecting to terminals 1, 2 and 3. If the generators supplying the two-phase energy are of the revolving-field type with their windings connected at the middle point, or if they are of stationary-field type having armature windings similar to a rotary converter, or if a rotary converter is supplying the energy, the auto-transformers will not serve, as in this case the connections will be as shown in Fig. 2, and there will be no potential difference between the middle points of transformers *A* and *B*. If the connection indicated by dotted lines from the middle of transformer *A* to the 86 per cent tap on transformer *B* be made, 36 per cent of the winding of transformer *B* will be short-circuited, thereby causing trouble.—*Elec. Jour.*, October.

Regulations of Alternators.—J. L. Routin.—The first part of a long discussion of methods for voltage regulation of alternators. The author first emphasizes that no strict distinction is possible between electrical methods, regulating the excitation, and mechanical methods, regulating the speed, because speed and voltage are not independent of each other. The author then discusses briefly various methods of regulating the speed and regulating the voltage. The paper is to be continued.—*La Lumière Elec.*, Sept. 26.

Lamps and Lighting.

Tungsten-Thorium Filament.—The activity of lamp manufacturers in trying additions to pure metals so as to reduce the electric conductivity of the pure metal and enable the use of shorter filaments is illustrated by a recent British patent (No. 20,227) of the British Thomson-Houston Company (General Electric Company of this country). It relates to a process for the manufacture of metallic filaments consisting of a mixture of tungsten and thorium oxide. Fine tungsten powder and thorium oxide are mixed with an alloy of cadmium, bismuth and mercury in the proportion of 35 per cent of the alloy to 65 per cent of the refractory material consisting of tungsten and thorium oxide in various proportions. From only a few per cent to as much as 50 per cent, by weight, of thorium oxide can be used. The alloy used as a binding agent is, of course, vaporized, and the filament sintered together in the usual manner. It is claimed that the hot resistance of a tungsten filament with an addition of 20 per cent of thorium oxide is about 50 per cent greater than that of the pure tungsten filament. As a filament consisting of 50 per cent thorium oxide cannot be easily welded to leading-in wires, a paste of fine tungsten powder with a trace of water-glass is used for making the connection, when such a high percentage of thorium oxide is present. If a higher percentage still of thorium oxide is used, the filament becomes brittle, but has a very high resistance, so that very short filaments without supports can be used.—Lond. *Elec. Eng'ing*, Oct. 1.

Lighting of Office Building.—B. G. Worth.—An illustrated description of the lighting equipment of a warerooms and office building in New York City. Diffused lighting is used throughout, both with arc lamps and tungsten lamps. In the floors lighted by arc lamps use is made of the General Electric "light-balancing selective diffuser." The diffuser consists of an arc lamp beneath which is hung a slightly translucent tulip-shaped shade. Around the arc lamp is an inverted conical, sheet-metal reflector, and beyond this again an annular ring or corona. All reflecting surfaces are dead white. On floors lighted by tungsten lamps the "extension diffuser" is used. It consists of an elongated, annular, cast-bronze frame, carrying an inverted bowl-shaped white pressed-steel reflector or diffuser. Three 100-watt clear tungsten lamps are placed in a line down the center of the frame and beneath the diffuser. Beneath these lamps is held an elongated, deep, leaded-glass shade, slightly translucent, which entirely conceals the lamps and reflects most of their light against the steel diffuser, from which it is distributed throughout the room.—*Gen. Elec. Rev.*, October.

Arc Lamps.—The first parts of a long illustrated serial on recent improvements of arc lamps. The descriptions are chiefly based on recent patent specifications. Arcs, both open and enclosed, with carbon electrodes one above the other, and arcs with carbon electrodes, slightly inclined and side by side, are first discussed, with special reference to the mechanical details of the regulating mechanism.—*Zeit. f. Beleucht.*, Aug. 30., Sept. 10, 20, 30.

Reflectors.—E. W. Weinbeer.—An illustrated article describing a graphical method for determining the construction of a reflector so as to produce a desired illumination on a horizontal surface.—*Zeit. f. Beleucht.*, Sept. 10.

Generation, Transmission and Distribution.

Double-Flow Turbine.—R. N. Ehrhart.—Recent advances in the art of turbine-generator construction have made it possible to

build generators of ratings as high as 10,000 kw to run at speeds of 1200 and 1500 r.p.m. for 60 and 25 cycles, respectively. Heretofore 720 r.p.m. and 750 r.p.m. were considered the highest speeds that were feasible. It was realized that the single-flow turbine if used at such high speeds and powers as proposed for this new line of generators would have certain limitations, and that a new type of turbine could be evolved that would meet the conditions more satisfactorily than any modifications of the standard single-flow type. The author discusses the difficulties in the design of single-flow turbines for this new line of generators, which have led to the new design of the double-flow steam turbine. He enumerates the advantages obtained by the adoption of the double-flow low-pressure element and the advantage obtained by the adoption of the high-pressure impulse element. The double-flow turbine does not in any way supersede the old standard single-flow turbine. It has invaded a new field involving the use of generators of very large powers having speds greater than previously thought feasible. In ratings up to 3500 kw the single-flow turbine has established itself as the most suitable prime mover to be obtained.—*Elec. Jour.*, October.

Electric Motors vs. Steam Engines in Factories.—R. E. BARKER.—An article giving statistical data on the use of steam engines and electric motors in manufacturing industries, especially from 1890 to 1905. In these 15 years steam power used in manufacturing has increased 136 per cent; electric power used in manufacturing has increased 7292 per cent; steam power expressed as percentage of total power has declined 3 per cent; electric power expressed as percentage of total power has increased 7.6 per cent. In the five years from 1900 to 1905 the average rating of the electric motor has decreased from 14.5 hp to 8.5 hp, which shows a marked tendency toward the use of small motors. In the same period the number of motors used had increased 124 per cent, and, therefore, the proof is conclusive that the modern tendency is in the direction of individual motor drive. —*Gen. Elec. Rev.*, October.

Energy Supply on British Northeast Coast.—C. H. MERZ.—A paper read before the Iron and Steel Institute. The author gave some particulars on the growth of the undertaking of the Newcastle-upon-Tyne Electric Supply Company, which now works in connection with the Durham Electric Power Distribution Company, and the Cleveland & Durham Electric Power Company, part of the plant of which has been altered to be of the same frequency. The whole scheme now combines eight generating stations aggregating 136,550 hp (including three "waste heat stations"), and three representing an additional 34,000 hp are under construction. The paper considered the questions of utilizing the waste heat from coke ovens and blast furnaces, etc., and pointed out the advantages of co-operation with a power company in this direction.—Lond. *Elec. Eng'ing*, Oct. 1.

New Zealand.—There are not less than 4,000,000 hp available in waterfalls in New Zealand, but they have been the vested property of the State, which has not had the money to develop them. It is now intended to permit portions of the falls to be employed for private enterprise "under strict and proper safeguards in the interest of the public."—Lond. *Elec. Eng'ing*, Sept. 17.

Hydro-Electric Stations.—E. ENGELMANN AND F. WUNDERER.—Statistical tables giving figures on hydro-electric stations in Switzerland, Sweden and Norway.—*Elek. u. Masch.*, Sept. 20.

Traction.

Single-Phase Traction Motors and Influence on Telephone Lines.—H. BEHN-ESCHENBURG.—A continuation of his long illustrated paper on single-phase motors of the Oerkikon Company, and induction effects from single-phase roads on telephone lines. The induction trouble on the Seebach-Wettingen road was found to be due chiefly to higher harmonics, impressed on the circuit by the periodic variation of the magnetic flux during the rotation of the slotted armature. The author gives the fundamental formulas for the voltage induced on a telephone line and shows that the potential of the induced higher harmonics is very greatly reduced by providing the telephone line with discarge coils. By their use and by special construction of the motors to prevent higher harmonics it has been possible to overcome all the original troubles on the 28 telephone lines which are running for about 11 miles at a distance of about 4 m along the 15,000-volt trolley wire. No other troubles of any kind have been experienced with the single-phase system in this case. The two locomotives have covered together about 70,000 km and there was no necessity of turning of the commutators or using any lubricating or cleaning means to keep the surfaces polished. There is no sparking whatever at the commutators. The motors were built in 1904 by the Oerlikon Company, and were originally designed for 200 hp, but give now without difficulty 330 hp. Like direct-current series motors, they are provided with interpoles and compensation windings, which insure perfect commutation at full speed. To prevent sparking at starting the following means are being employed: Practice has shown that there are perfectly safe carbon brushes available which do not spark as long as the effective voltage between their outer edges is not above 7 volts, and the effective current per square centimeter of contact surface is not much above 15 amp. For mechanical reasons these brushes are made in a thickness of at least 8 mm. The segments of the commutator are 4 mm wide. It is, therefore, necessary that the potential difference between three segments, each 8 mm wide, which can be simultaneously in contact with a carbon brush 8 mm wide, should not be above 7 volts. This is the chief condition for the design of good series motors. This condition restricts the strength of the magnetic field, but presents no practical disadvantage, and compared with the practice of the Westinghouse Company, which employs a much stronger magnetic flux, it has the advantage of avoiding special resistors between winding and commutator, which are necessary with stronger magnetic flux.—*Elek. Zeit.*, Oct. 1.

Electric vs. Steam Traction on Railways.—M. PAVLITZKY.—A paper read before the fourth Russian Electrical Congress. As the ultimate limit of the economical load on a railway is prescribed by the power and other qualities of the locomotive, a general comparison between the peculiarities of steam and electric locomotives defines the character and extent of the improvements which are potentially attainable by the substitution of electric for steam traction. While the power of a steam locomotive is limited, in effect, by the steaming ability of its boiler, and the limits are already attained, the power of an electric locomotive is limited only by that of the station supplying the power, and instead of providing many different types of locomotives to suit different services, and more or less different sections of line, the electric locomotive lends itself to standardization and to the application of power as and when it is needed by the use of the multiple-unit system. "The efficiency of the electric locomotive considered as a motor is greater than that of a steam locomotive; it utilizes the whole of its weight, or even some of the live-load weight, for adhesion; it can be built with no longer rigid wheel base than that of the train vehicles; the tractive effort distributed over a larger number of wheels, and applied by a steady rotary motion, instead of one subject to the effect of reciprocating masses, is greater per ton of axle load, and applied with less severe stresses upon the track and structures, than that due to a steam locomotive; the power used in propelling the locomotive itself is very little in excess of that required by a similar weight of ordinary vehicles, while the steam locomotive requires from two to three times the pull per ton of total weight." In the construction of new railways, especially in mountainous districts, considerable economy will be possible by the adoption of shorter routes with more severe gradients and curves than are advisable on a steam line. Weight for weight, the steam locomotive is cheaper than the electric locomotive, but such a basis of comparison is erroneous; power for power, the positions are reversed. In many cases of new lines the total cost of construction and equipment may be less, or at least not exceed, that for steam traction. However, there will be many cases in which the first cost will retard electrification, though it will not lead to its ultimate rejection. In the electrical equipment of

existing lines the capital expenditure involved is more serious, and both for new or existing lines the question in every case is whether electric traction will offer advantages which will cover the interest and sinking fund charges upon the first cost.—*Bull. de l'Inst. Elec. Montefiore;* abstracted in Lond. *Elec. Eng'ing,* Sept. 17.

Electric Traction and Power Supply from Large Stations.—O. Petri.—A paper read before the recent International Congress of Street Railways and Light Railways in Münich. The development of light railway traction in Belgium, France and Germany is given in the following table, which shows that Belgium has gone farthest in the erection of street railways per unit of area as well as per capita, while the financial results in that country are also least satisfactory.

	Network in kilometers.	Kilometers of light railways and street railways. Per hectar.	Per 10,000 inhabitants.	Mean dividend.
Belgium	2,932	9.9	4.1	1.50
France	6,114	1.1	1.56	3.16
Germany	8,232	1.5	1.3	2.48

In Germany there are at present only four cities with more than 35,000 inhabitants which have no street railway. The general financial results in Germany are also unsatisfactory, the mean dividend of street railways being 2.5 per cent. The electric street railways and light railways may be divided into two groups, those that have their own generating stations and those that buy energy from a central station. The cost of energy in per cents of the cost of operation and per kw-hour are given in the following table, the figures, of course, representing mean values:

	Energy cost in per cents of cost of operation.	Cost of 1 kw-hour.
Light railways with their own stations.	19.6	1.66 cent
Light railways which buy energy from a central station.....	27.7	2.85 cent

The average cost of energy for electric street railways is 2.49 cents per kw-hour. The ratio of the energy cost to the first cost has the comparatively high value of 3.34 per cent. This ratio is important for estimating the economy of operation. One of the best means of reducing this ratio is by erecting large central stations near coal mines or waterfalls to supply energy over a wide area in the neighborhood. An example is the central station at Essen of the Westphalian Electricity Works, which contains now five steam turbines having a total rating of 40,000 hp and five reciprocating engines of 60,000 hp. This station generates per year from 50 to 100 million kw-hours. The first cost amounts to $73 per kilowatt installed. In 1906 a similar plant was erected in the coal district of Upper Silesia, which sells a kw-hour at 0.42 cent, the coal mined there having a high calorific value. In this case the ratio of energy cost to first cost is 1.97 per cent. By utilizing advantageously located water powers the ratio may be reduced to 1 per cent. The author speaks strongly against the projected tax on electricity in Germany. The result would simply be that street railways would have to increase their fares. Some calculations are added for two Austrian railways. For the railway from Salzburg to Berchtesgaden, which is to be operated by single-phase currents at 10,000 volts from a hydro-electric station, it is estimated that the cost of operation without cost of energy, but including amortization of the electric equipment, will be $43,760 for electric operation, against $64,060 with steam traction. There is, therefore, left a difference of $20,300 for energy cost. Since the yearly energy consumption is estimated at 1,700,000 kw-hours, the kw-hour must cost not more than 1.2 cent if electric operation shall be more economical than operation by steam. For the railway from Garmisch to Dartenkirchen single-phase traction is also projected, energy being supplied from a 22,000-hp hydro-electric station.—*Elek. u. Masch.,* Sept. 20.

Foreign Single-Phase Electric Roads.—A table giving a summary of foreign single-phase roads, with names of manufacturers, etc. There are in operation 30 purely single-phase roads, with a total mileage of 735; the number of cars is 192; the number of locomotives, 43; the aggregate motor rating is 60,220 hp. There are under construction three more purely single-phase roads, with a mileage of 58. Further, there are in operation three combined single-phase and direct-current roads, with a mileage of 36, using 30 cars with a motor rating of 3940 hp. These roads are built in Austria, Belgium, England, France, Holland, Italy, Norway, Prussia, Sweden and Switzerland. The trolley potential ranges between 500 and 20,000 volts. From a note by J. E. Miller, in the same issue, it appears that there are now in the United States and abroad 64 single-phase roads, with 1795 miles, with 462 cars, and 100 locomotives, the total motor rating being 201,560 hp.—*Elec. Journal,* October.

Economy in Energy Consumption on Tramways.—R. G. and J. G. Cunliffe.—A paper read before the (Brit.) Municipal Tramways Association on certain methods of economy in energy consumption. Among the proposals is that the usual gage of the trolley wire should be much increased, and that the wire should be frequently renewed, as the authors think that the wear on the trolley wire increases the Joulean heat losses sufficiently to make this worth while. They also propose a modified arrangement of trolley wires, consisting of two bronze wires, one for each track, with a copper wire between. Other suggestions were for copper-faced fish-plates, a modification in the controller connections and an alternation in the design of cars. —Lond. *Elec. Eng'ing,* Oct. 1.

Single-Phase Road.—H. L. Kirker, L. M. Aspinwall and G. Bright.—An illustrated article on the St. Clair Tunnel electrification, with an illustrated description of the single-phase locomotives used there.—*Elec. Jour.,* October.

Installations, Systems and Appliances.

Operation of Transformers in Parallel.—J. W. Woolbridge.—Transformers operated in multiple will divide the load inversely as their impedance or directly as their admittance. Hence, if transformers are to operate successfully in multiple, they must have the same percentage of impedance volts at the rated load current, and the ratio of the primary voltage to the secondary voltage must be the same. The author shows how to determine the load taken by the different transformers if they do not have the same percentage of impedance loss. If it is found that the load on some of the transformers will be too great for safe operation, a part of this load may be transferred to the other transformers by inserting reactance coils in series with the transformers carrying too much load. If, however, the transformers are not banked together, but scattered over a distributing network, the division of load will be different, and there is a greater natural tendency for each transformer to take its proper load. In a secondary network it is often difficult to determine the exact impedance or resistance of the lines from the transformers or the exact location of the center of distribution, and calculations should, therefore, be checked by measuring the current output of each transformer when under maximum load conditions. This can be conveniently and accurately done by means of a cable-testing current transformer.—*Gen. Elec. Rev.,* October.

Lightning Arresters.—E. Ballois.—An illustrated article on the construction of electrolytic lightning arresters—*La Lumière Elec.,* Sept. 19.

Wires, Wiring and Conduits.

Calculation of Networks.—A. Curthod.—A mathematical article on a method for determining the location of the centers of distribution (feeder points, transformers, etc.) in a distribution system. The object of this method is to determine the number of distribution points for which the cost of installation becomes a minimum. An example is added.—*La Lumière Elec.,* Aug. 29 and Sept. 26.

French Wiring Rules.—The complete set of instructions for carrying out electric installations adopted by the French Association of Steam Plants with Electric Service (Amiens, Lyons, Marseilles, Mulhouse-Nancy), by the Association of Manufacturers of Northern France (Lille), and by the Norman Association for the Prevention of Accidents (Rouen).—*La Lumière Elec.,* Sept. 5, 12, 19, and 26.

Wire-Covering Machinery.—An illustrated description of some new machinery for covering wire with cotton, of a method

for polishing the covered wire, and of machines for making enameled and fireproof coverings for wires.—Lond. *Elec. Eng'ing,* October.

Electrophysics and Magnetism.

Rectifying Effect of an Alternating-Current Arc.—J. SAHULKA.—Under certain conditions an alternating-current arc between electrodes of equal composition may have a rectifying effect. For instance, with two carbon electrodes one above the other, of equal thickness, the lower carbon is always positive, so that the direct current produced has in the external circuit the direction from the lower to the upper carbon. On the other hand, with carbon electrodes of different thickness, the thin carbon is always positive. The rectifying effect is due to a difference in temperature of the two electrodes. It is easier for the current to pass through the arc in the direction from the cold to the hot electrode than in the opposite direction. With two vertical carbons of equal thickness, the lower carbon is always the hotter one, because its cooling facilities are poorer. In two carbons of different thickness the thinner one is the hotter one. The rectifying effect can be increased by special cooling devices, and the author has made experiments with an arc between a carbon rod and a carbon disk which was rotated. In the external circuit the direction of the direct current is from the carbon rod to the carbon disk. The rectifying effect increases with the arc length. It is easy to obtain direct current having one-seventh the strength of the effective alternating current. By special arrangements the author was able to increase the efficacy, that is, the ratio of the direct-current power to the total power, to about 30 per cent.—*Elek. Zeit.,* Oct. 1.

Constitution of Electric Spark.—T. ROYDS.—A Brit. Assoc. paper giving an account of investigations of the constitution of the electric spark. The author formerly photographed on a rapidly-moving photographic film the spectrum of the ordinary oscillatory spark with small self-induction. He has now extended these investigations by gradually increasing the self-induction of the circuit. The commencement of the spark is marked by a sudden and almost instantaneous luminosity of the air, showing on the photographs as a narrow vertical line. After the initial air discharge has passed, the light from the spark is due chiefly to the metallic vapor which is produced. The moment of vaporization of the metal is simultaneous with the passage of the initial arc discharge. The first streamer in the metallic vapor often reaches to the center of the spark. The slope of this streamer gives the velocity with which the vapor first produced is moving along the line joining the two electrodes. The luminosity of the metallic vapor afterward consists of streamers starting from the electrodes. At the instantaneously positive electrode the luminosity of the streamers is of longer duration than at the negative, where the streamers are not so numerous nor so distinct. At the commencement of the spark, vapor is produced at both the positive and the negative electrodes. When the self-inductance of the spark is increased, it is seen that during a single oscillation several streamers start from the electrodes; they are more distinct with magnesium than with lead, bismuth or mercury. The streamers are too numerous and close together to make useful the supposition that they are due to harmonic overtones of the fundamental period of the circuit. The streamers are found to recur at definite intervals after the commencement of each oscillation of the spark, though they are not invariably present in every oscillation; generally not more than about 10 appear in a single complete oscillation.—Lond. *Elec. Eng'ing,* Sept. 17.

Evolution of Heat from Pitchblende.—H. H. POOLE.—An abstract of a British Association paper in which the rate of evolution of heat from pitchblende was determined by careful thermometric tests with a spherical vacuum-jacketed vessel filled with powdered and carefully dried pitchblende, the whole being buried in ice. He finds the heat evolution per gram of pitchblende to be 0.000094 calorie per hour. This is about twice the quantity estimated from the known amount of radium present.—Lond. *Elec. Eng'ing,* Sept. 17.

Helium from Radioactive Elements.—F. SODDY.—An account of an experimental research extending over three years, made to detect the alleged production of helium from primary radio-elements. The chief results are as follows: The present rate of production of helium from uranium and thorium indicated by theory is about 2×10^{-12} per year as a minimum value, if it is produced at all, or about 4.5×10^{-12} per year, calculated by an indirect method of the assumption that the alpha-particle is an atom of helium. The first of these values is almost one-eighth of the value indicated when the author started his experiments three years ago. The minimum quantity of helium detectable by the spectroscope by the special methods of the author is 2×10^{-10} gram, which is somewhat greater than was formerly supposed. The problem has, therefore, proved to be more difficult than appeared at first. With the quantities of uranium and thorium employed in the author's experiments, a period of accumulation of several months is necessary to detect the helium, if produced at the theoretical rate. The author has overcome the experimental difficulties in the way of performing these tests, but has so far obtained only one positive result, indicating a rate of helium production of 2×10^{-12} per year. "This result is, of course, of no significance until it is confirmed. All the other tests so far obtained indicate merely that the rate of production of helium from both uranium and thorium is certainly below what was first deduced from the imperfect theory, and is certainly not above the rate indicated by the present theoretical data."—*Phil. Mag.,* October.

Units, Measurements and Instruments.

Meters.—An official communication by the Reichsanstalt by which a direct-current motor meter of the Siemens-Schuckert Company is admitted for calibration. The construction is shown in Fig. 3. The disk-formed armature revolves in the

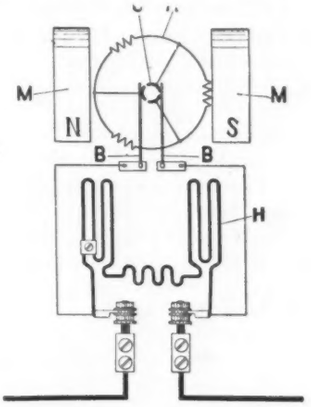


FIG. 3.—DIAGRAM OF METER CIRCUITS.

flux of two permanent magnets and is connected in parallel with a resistor *H* in series with the circuit. The armature winding has three coils and revolves between two thin aluminum disks which act as brakes. The resistance of *H* is so great and the speed of revolution so low that the counter e.m.f. in the armature is small compared with the resistance voltage drop in the meter. The speed of revolution is, therefore, practically proportional to the main current.—*Elek. Zeit.,* Oct. 1.

Regulators.—R. VON MISES.—A contribution to the theory of regulators. Airy's, Maxwell's and Stodola's theoretical investigations have shown that the operation of a regulator can be stable only when it is provided with a brake; that is, it should overcome a resistance to its motion which increases with the deviation from normal condition. On the other hand, most practical regulators have no special brake. The explanation is that the rolling friction in the bearings of the regulator acts as a brake. The author investigated in detail the effect of the momentum of inertia and tries to establish the conditions under which a regulator which would be unstable in the sense of the theory of small oscillations yet remains practical. The paper is of a highly theoretical nature.—*Elek. u. Masch.,* Sept. 13.

Meters.—An official communication by the Reichsanstalt on induction meters for single-phase and polyphase currents, made

by Mix & Genest. These meters are admitted for calibration by the Reichsanstalt, and their construction and method of calibration are described in detail.—*Elek. Zeit.*, Sept. 3.

Telegraphy, Telephony and Signals.

Leakage in Telephone Lines.—F. Lueschen.—The damping coefficient of telephone lines is usually determined from the expression $\frac{R}{2}\sqrt{\frac{K}{L}}$, where R is the resistance, K the capacity and L the self-induction per kilometer of double conductor. This is approximately correct, but it is often important to take the leakage (including the dielectric losses) also in consideration. If A is the leakage constant ("ableitung"), the expression for the damping coefficient is $\frac{R}{2}\sqrt{\frac{K}{L}}+\frac{A}{2}\sqrt{\frac{L}{K}}$. The most economical self-induction is $L=RK\div A$; the damping coefficient then becomes $\sqrt{KA}$. For lines loaded with inductance coils according to the Pupin system, the resistance per unit length increases together with the inductance per unit length, and the most economical self-induction is $\frac{RK}{A+aK}$ and the damping coefficient is $\sqrt{R}(A+W\frac{K}{L})$, where W is the effective resistance of the Pupin coils per kilometer. The ratio of L to W is called the time-constant of the coils and it is important to make it as large as possible. The author finally investigates the extent to which the most economical value of the damping coefficient has been attained in the Pupin cables thus far constructed.—*Blätter f. Post u. Tel.*, No. 9, 1908; abstracted in *Elek. u. Masch.*, Sept. 13.

Ammeter Shunts for Large Currents.—K. Hoerner.—The design of ammeter shunts for large currents (several thousand amperes), such as are used in electrochemical works, involves some difficulties, if the consumption of power in the same shall not be excessive. The author discusses the paths of the lines of currents in such shunts and the precautions which must necessarily be taken in making the connections.—*Elek. Anz.*, Aug. 27.

Compensation Method.—The first part of an illustrated article describing methods of measuring current and voltage by the compensation method.—*Elek. Anz.*, Sept. 24.

NEW APPARATUS AND APPLIANCES

Walser Wireless Sign Panels.

The A. & W. Electric Sign Company is placing on the market a line of wireless interchangeable letter sign panels, examples of which are represented by the accompanying illustrations. The Walser interchangeable letter panel is composed of an insulated monogram panel contained in a waterproof galvanized iron cabinet, around which is mounted a porcelain enameled ornamental plate to serve as a background or frame for the panels. On the face of the cabinets a porcelain enameled letter plate is fastened by sliding it over flanges on each side in such a manner as to make a waterproof cover. In the face of the letter are holes through which are inserted a removable receptacle which contains the lamp that outlines the letter on the plates.

The monogram panel consists of a perforated insulating plate composed of a special asbestos mineral composition, upon the face of which is mounted a perforated copper plate which makes the contact to the copper shell of a special removable receptacle when screwed in place. On the back of the insulating plate is fastened a perforated brass plate, the holes of which are threaded to receive the stem of the removable receptacle which passes through the perforations of the other plates and makes a contact for the center connections of the receptacles and lamp. The perforations in the monogram panel are so arranged that any numeral or any letter of the alphabet in either 12 in. or 16 in. sizes can be used on each panel. There is no wire used to connect the receptacles, the only conductor necessary being the main leads, which are run from one cabinet to another through iron conduit connecting the lugs leading through a fusible connection on each panel, thereby protecting each letter at the point of possible trouble.

WIRELESS SIGN PANEL.

The cabinets are composed of 18 gage galvanized iron and soldered so as to make them waterproof; they are coated with two coats of special galvanized primer, and afterward covered with a heavy black lustral enamel composed of special ingredients to withstand the action of the elements.

The cabinet plates are made of 18 gage rolled steel and are enameled with a vitreous substance which is fused into the face of the steel at a temperature of 2400 deg., making a finish which is as hard and glossy as glass and equally impervious to action of rain, sun, or rust. These plates are ornamented with a neat border of white and background of royal blue, making a handsome frame or finish for the panel cabinets. The face plates are also enameled, and the letters or figures are made of white on a background of royal blue. They also are practically indestructible, never require repainting or refinishing and can be cleaned with soap and hot water in a very short time, having then the appearance of new plates. These plates have grooves which slide over the flanges on the panel cabinets, and when in position make a waterproof cover for the cabinets. The face plates are made with either 12-in. or 16-in. letters or figures and can be used on the same panel.

The Walser panels have been designed to meet a growing demand from central stations for a changeable letter electric sign of simple construction which could be adopted for rental purposes. The modern method of increasing the sales of electricity is to popularize the use of electric signs for advertising purposes, and to do this most effectually central stations should be in a position to furnish signs at a low rental rate or on the deferred payment plan. The wireless panel system enables this to be done, and its attractive features appeal to the merchant and advertiser. The system is also especially adapted for theater announcements. An installation of 30 panels with a stock of 100 extra letter sheets is sufficient to announce every leading attraction now on the boards.

"I-Comfort" Indirect Lighting System.

The National X-Ray Reflector Company, of Chicago, is just introducing reflectors and reflector casings or holders for use with tungsten lamps in a system of indirect lighting, in which the lamps are concealed and the lighting of the room is accomplished by reflection from the ceiling. The present system is intended for common use in residences, offices and assembly rooms with low ceilings. The indirect system in this case is made commercially feasible and economical by virtue of the low cost of producing light with the tungsten lamp, combined with efficient reflectors. The general plan of the system outlined below is to suspend in a room at the ordinary height and location of a chandelier a tungsten lamp with a corrugated silvered mirror glass reflector underneath. The lamp is invisible to persons in the room, and the light is directed to the ceilings and upper walls and from thence by diffuse reflection to the

lower part of the room. Of course this is applicable only where the ceiling is light in color. This, however, is a condition which generally exists, as dark ceilings are the exception rather than the rule. It is not necessary to have light walls, as most of the light is obtained by reflection directly from the ceiling. However, light walls assist materially in the illumination of a room, just as in direct-lighting systems. In order to secure

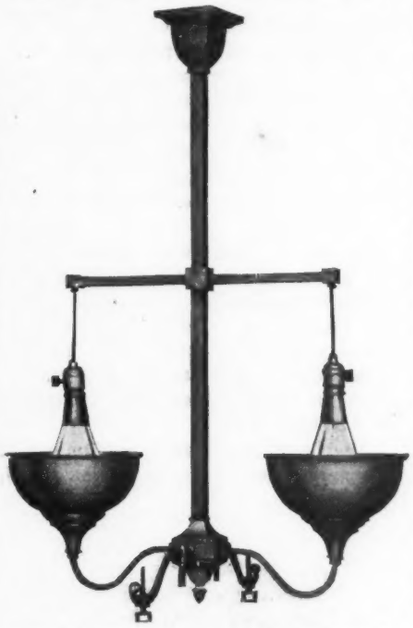


FIG. 1.—SINGLE ELECTRIC UNIT WITH TIP OF LAMP DOWNWARD.
FIG. 2.—TWO-UNIT COMBINED ELECTRIC AND GAS FIXTURE, LAMP TIP DOWNWARD.

high efficiency, the reflector has been designed with a shape which produces a large flux of light in the central part of the ceiling near the chandelier. The illumination of the ceiling gradually diminishes until the upper sidewalls are reached. By directing much of the light toward the central part of the

FIG. 3.—ROOM ILLUMINATED WITH SINGLE UNIT FIXTURE, CONTAINING A 60-WATT TUNGSTEN LAMP.

ceiling it is reflected down to the useful plane with only two reflections, thus causing a minimum loss and overcoming an element of inefficiency which has been present in many concealed or indirect lighting systems where the light is reflected back and forth many times from wall to wall.

To eliminate the streaks on the ceiling which would be cast by a tungsten lamp either bare or with a plain reflector, the reflector is corrugated. This type of reflector consists of one piece of glass with a mirror coating applied on the outside, protected by an elastic enamel or paint which does not crack with changes of temperature. As the painted exterior of the reflector does not harmonize with the ordinary chandelier finish, a brass spinning or other ornamental bowl or basket is used to support the reflector. Fig. 1 illustrates a 1-lamp chain fixture for indirect lighting. Fig. 4 shows a room illuminated by this method, the photograph having been taken by the light of the lamp in the fixture seen in the center of the room. The fixture in Fig. 4 is adapted for one tungsten lamp of 48 or 80 cp. Fig. 2 shows a 2-lamp combination gas and electric fixture with the tungsten lamps pendant. Fig. 3 shows a fixture with lamps upright, which can be used should it prove advisable to install tungsten lamps in an upright position. This latter plan makes the fixture design simpler, as no provision need be made for suspending the lamps in the reflector. It is evident that the system offers good opportunities for the fixture designer, as the necessity of placing glassware in sight is entirely eliminated.

In the average living-room, which may be assumed to be from 14 to 15 ft. square, one 100-watt tungsten lamp will give ample illumination for all ordinary purposes if the walls are dark in color. If the walls are light, a 60-watt tungsten lamp will in many cases be sufficient. These results indicate that an indirect lighting system with tungsten lamps may be substituted for many of the direct-lighting systems commonly in use now with common carbon filament lamps, and that the expense of operation will not be increased over that of the old system. In fact, it may in some cases be decreased. Many rooms of this size now have two or more common 16-cp 55-watt lamps in continuous use, while they are occupied. This power would be sufficient for the indirect system with tungsten lamps.

The great object of the system is, of course, to eliminate the discomfort to the eyes of having exposed lamps, and to do away with annoying shadows. Where a room is lighted by diffuse reflected light from the ceiling in this way, reading becomes easier than where light is received directly from intense sources, because there is less annoying glare of reflection from the highly-sized paper now commonly used. The absence of any exposed source of light in a room causes conditions more nearly approaching daylight. There is such comfort to

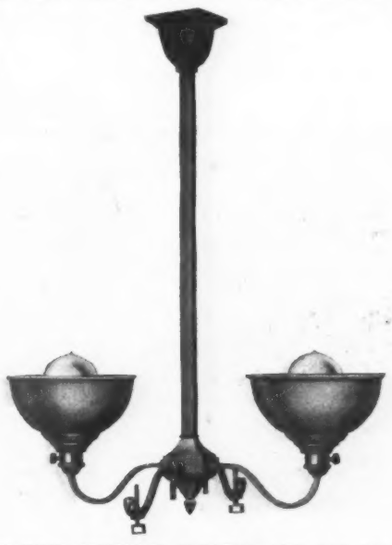
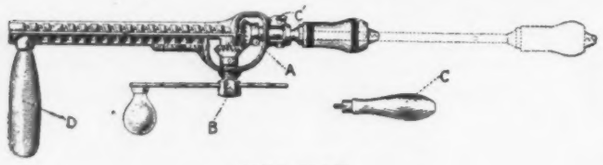


FIG. 4.—TWO-UNIT COMBINED ELECTRIC AND GAS FIXTURE, LAMP TIP UPWARD.

the eyes as compared to direct lighting systems that the manufacturers are marketing this combination of indirect lighting appliances under the trade name "I-Comfort System." A practical demonstration of this system was given at the Oct. 15 meeting of the Chicago Section of the Illuminating Engineering Society.

Drill Brace for Electricians.

The accompanying illustration shows a telescopic drill brace made by J. H. Rusby, of Newark, N. J. The brace is adjustable to three different lengths by pressing the latch on the shaft gear *A* and drawing out the shaft. The crank also is adjustable by pressing the latch on the crank head *B*, to 4, 6, 8, 10 or



DRILL BRACE.

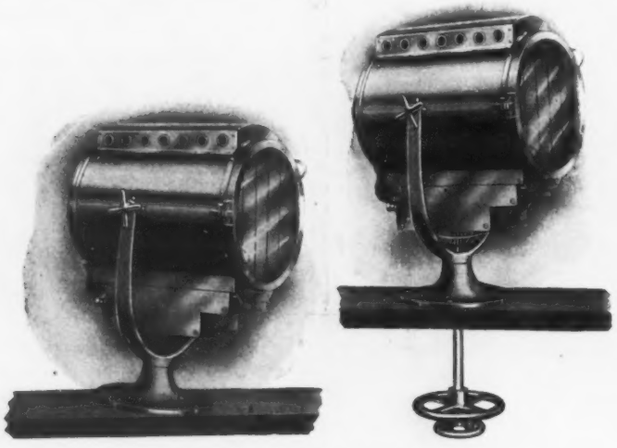
12 in. sweep. The length of the brace over all closed is 16 in. and open it is 23¾ in. with a stop midway between these extremes. The frame is made of malleable iron and the gear wheels are of steel. By screwing the handle *C* into the frame at *C'* the device may be used as a breast drill. The handle *D* is also removable.

Small Searchlights.

The two searchlights shown in the accompanying illustrations are probably the smallest electric arc searchlights that have ever been commercially made, measuring only about 7½ in. in diameter. They are equipped with a 7-in. Mangin mirror, and have a horizontal carbon feeding mechanism, which mechanism is entirely automatic or may be operated by hand at the will of the operator. The feeding of the carbons is controlled by a shunt magnet, which will maintain the voltage with only about five volts variation during the entire consumption of a pair of carbons. The mechanism is self-contained, and may be removed from the searchlight by disconnecting two small screws.

The searchlight shown in Fig. 1 is intended to be placed on the bow of small launches or yachts, and has a range of about three-quarters of a mile, or probably more under exceptional conditions. It is made entirely of polished brass and requires a current of three or four amperes and 60 volts to throw a light of about 1000 cp.

As shown in Fig. 2, the searchlight is adapted for use on the



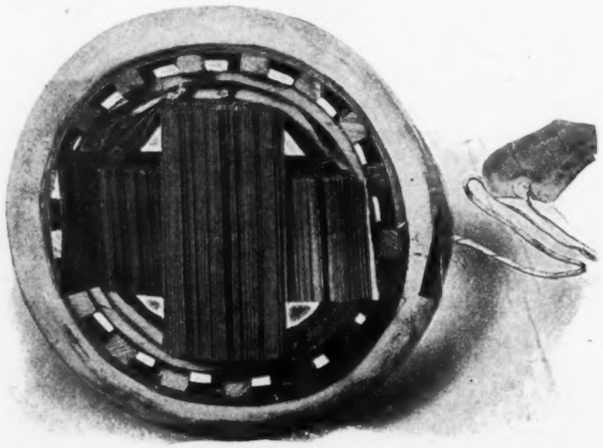
FIGS. 1 AND 2.—SEARCHLIGHTS.

top of the pilothouse, with the hand wheels projecting below within easy reach of the pilot. The larger upper wheel controls the horizontal motion, while the small lower wheel gives the vertical motion to the searchlight cylinder. A segment of a gear is attached to the searchlight cylinder, and a small pinion on a vertical rod engages with this segment; turning the lower hand wheel turns the pinion, which imparts motion to the searchlight cylinder. This searchlight may be operated by any small dynamo of 60 volts or over and with a capacity of 3 amp or more. This type of searchlight is made by the Carlisle & Finch Company, Cincinnati, Ohio.

Transformer.

The illustration herewith gives an end view of one leg of a Pittsburgh core-type transformer, and shows the provision made for the circulation of oil through the interior of the transformer. The silico-vanadium steel core is built up in the shape of a cross which leaves four open spaces, one at each corner. As the coils stand vertically, each ventilating space acts like a flue, through which this together with a current of cooled oil flows, practically surrounding the core. This oil, moreover, serves to cool the inside layer of the secondary winding. Solid strips interposed between the secondary winding and the primary winding form about 18 ventilating spaces through which cool oil also is constantly flowing over the outside layer of the secondary, and also the inner layers of the primary winding, thereby keeping all portions of the winding at an equable temperature, the outside of the primary winding being in direct contact with the oil in the transformer case, is thereby cooled.

The illustration may appear unusual to those familiar with the appearance of the core type transformers, as the coil is



END VIEW OF ONE LEG OF CORE-TYPE TRANSFORMER.

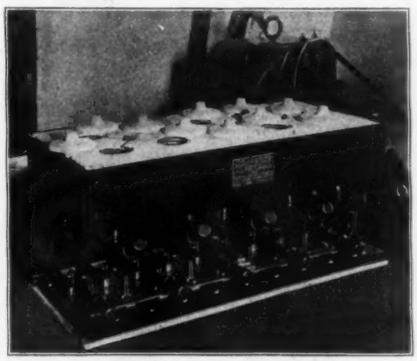
lying flat upon its side and the camera was pointed directly at it in order that the light showing through the ventilating spaces would plainly indicate and show up the same. This particular coil is intended for a 50-kw Pittsburgh transformer.

The usual tests of temperature conditions by means of resistance measurements are rather misleading, on account of the fact that the resistance measured is the total average resistance of the coil. The coil might be very hot in one portion and cool in another, and the resistance measurement would not indicate this. It is naturally of no use to cool a transformer fairly well as long as there may be some portions of the winding running at high temperatures, for the reason that it is at these hot spots that the insulation gradually breaks down.

In order, therefore, to secure even temperatures throughout the winding and consequent long life and durability, it is necessary so to design a transformer that the cooling oil can freely circulate between sections of the winding, and also between the windings and the steel core. The provision made by the Pittsburgh Transformer Company for securing this result is well indicated in the illustration. It is also of interest to note that in case direct temperature measurements are desired, a thermometer may be inserted in any one of the ventilating spaces or between the steel core and the winding, and the exact temperature of such portion of the transformer thereby directly obtained.

Electric Resistance Furnace.

The electric resistance furnace shown herewith is designed for use in connection with a special transformer and hence is applicable for alternating-current circuits only. The wire used is of very large section, about ⅛-in. square, and a feature of the construction is that the heating units can be replaced by the operator by simply loosening two screws. The transformer is designed so that the furnace temperatures are controlled by

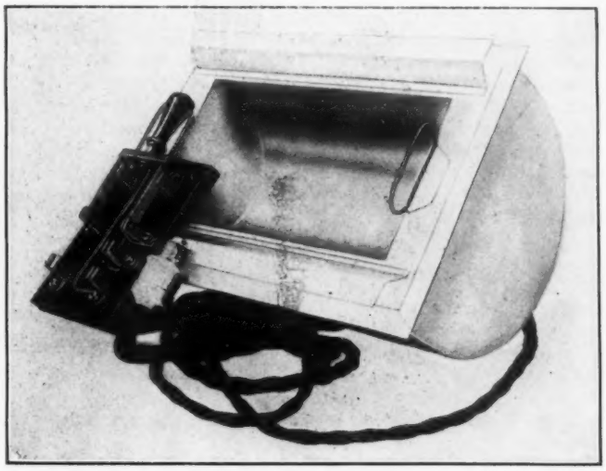


RESISTANCE FURNACE.

changing a plug on the transformer to give 6, 8 or 10 volts. The rheostatic control, with its attendant waste, is thereby eliminated. The furnace described has 10 crucible openings large enough to take a 15-cc platinum crucible, and in addition to the ruggedness of its construction possesses the desirable feature of rapidly heating the substances placed within it to temperatures as high as 2160 Fahr. The application of heat is direct and not through refractory substances like fireclay, etc., which require the wire to be considerably hotter than the interior of the furnace. The manufacturer of the furnace is the Hoskins Company, Chicago, Ill.

Electric Chocolate Dipping Pan.

The accompanying illustration shows an electrically heated dipping pan designed to meet a demand from candy manufacturers for a device by which chocolate can be kept in a fluid



CHOCOLATE DIPPING PAN.

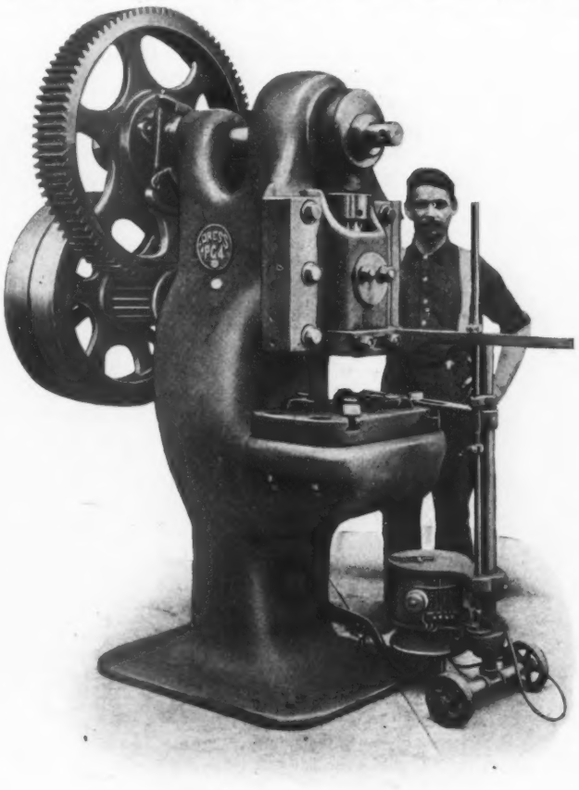
state at proper consistency for continuous dipping, especially in cases when the work is done in refrigerated rooms. The pan consumes about the same quantity of electrical energy as a 16-cp carbon filament lamp. The device is usually made with a high and a low heat, the change from one to the other being by means of a small switch. The high heat will bring the chocolate to the working temperature in a short time, at which temperature it will be maintained by the low heat.

The heating element is upon the outside of a receptacle in which the chocolate pan is placed and is hermetically sealed in by an outer jacket. The heater and wires are shielded so that accidental contact with them cannot be made. The warmer can be set in the top of a table and connected with the heat control switch by the engineer on the premises, according to a simple wiring diagram, or be connected to a lamp socket, but permanent wiring is recommended for factories. The dipping pans when received are ready to place in a table and connect up and then they are ready for immediate use.

The above apparatus, known as the Hadaway chocolate dipping pan, is made by the Westinghouse Electric & Manufacturing Company.

Clutch-Tripping Device for Metal Stamping Presses.

Heretofore presses for stamping sheet metal were provided with a clutch connecting the fly- or gear-wheel with the shaft and tripped by means of a foot-treadle, the tripping operation usually being performed by a boy. The Ferracute Machine Company, of Bridgeton, N. J., has brought out a simple electrical contrivance for doing this work, consisting of a weight or plunger raised by a solenoid and dropped by gravity when the circuit is interrupted. The core of the solenoid projects through the top of its casing, affording an opportunity of latching it when not in use. The foot of the device is connected to the solenoid by a ball joint. An arm attached to the ram of the press raises the trip rod as the ram nears the top of its stroke, thereby breaking the circuit and releasing the weighted core; the trip rod descending with the ram until contact is again made, when



STAMPING PRESS.

the weight rises; the continued making and breaking of the circuit giving the desired intermittent vertical motion heretofore performed by the foot of the operator or boy. The device is adjustable to adapt it to the wide variety of sizes of presses, there being a split sleeve at the base allowing the foot to be adjusted up or down, and the trip rod is long enough to reach the rams of all ordinary sizes of presses. The device is mounted on wheels, rendering it available for use on any machine.

Simple Pull Socket.

A small device is shown herewith, known as the "Just Pull" attachment, which as its name indicates is employed for the purpose of transforming the ordinary key socket into a pull socket. The device is readily and even instantaneously adjusted by springing the clamp to fit the key of the socket. The material used is inexpensive, little work is required in manufacture, and hence the device is sold at a very low price and finds its way into places where the standard familiar device has not been adopted for considerations of cost. The appliance has been placed on the Eastern market by the Electric Home Supply Company of 45 West Thirty-fourth Street, New York.

PULL SOCKET.

Stamping Presses in the Electrical Industry.

One of the machines which have contributed to the success of electrical manufacturing has been the stamping press, which has now reached a high degree of development. In Fig. 1 is shown what is known as a "Stiles power punching press," which is built in many forms and sizes. The range of work for which these presses are adapted covers blank cutting, punching, perforating, forming and bending, including a large proportion of the operations required in the manufacture of electrical devices made of sheet brass and steel. A valuable feature of the machine is an adjustment mechanism graduated to one-hundredth of an inch on the eccentric disk, which enables the operator to keep an exact record of the dies and to set them without loss of time.

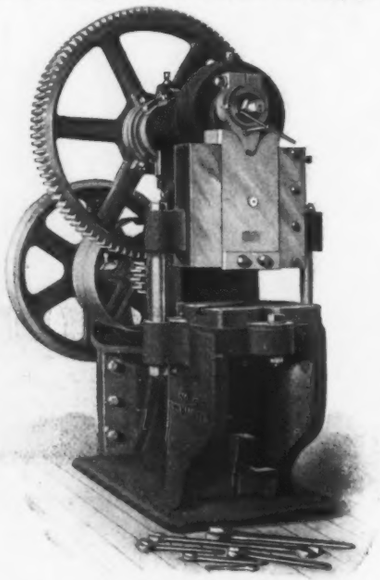


FIG. 1.—GEARED PUNCHING PRESS.

A geared type of the "Bliss straight-sided power press" is illustrated in Fig. 2. This press is also built without gearing, and, if the nature of the work demands it, with double or even triple gearing. This machine is especially adapted for very heavy stamping, shaping and punching in the manufacture of electrical parts and instruments, taking care of work that is beyond the ability of the press illustrated in Fig. 1. These presses are provided with slides of unusual length and width, insuring accurate work and long life for the machine and tools. An easy, rapid and accurate adjustment for different heights of dies is provided for. This type of press is also built with a cam-actuated stripper. With this stripper the cams come down on the work about to be pierced and hold it perfectly flat while the die and punch are doing their work, continuing to hold it flat against the die until the blank has been stripped from the punch when it is automatically raised from the die, leaving a free space, thereby enabling an operator to manipulate and observe his work quickly and accurately. The press shown in Fig. 2 is built in eight sizes, weighing from 5000 lb. to 75,000 lb.

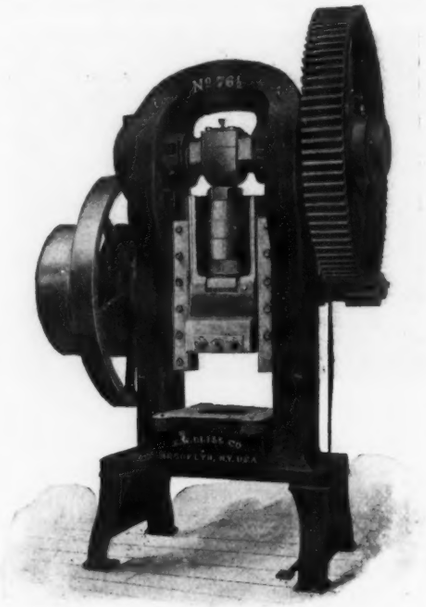


FIG. 2.—STRAIGHT-SIDED PRESS.

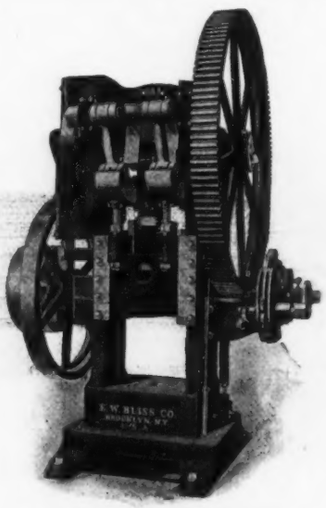


FIG. 3.—TOGGLE-DRAWING PRESS.

Fig. 3 shows a toggle-drawing press, which is built in sizes weighing from 5600 lb. to 150,000 lb., and used in the manufacture of seamless metal articles of all sizes, such as lamp shades, meter cases, arc-lamp cylinder tops, etc.

Industrial and Commercial News

Commercial Intelligence.

THE WEEK IN TRADE.

There has been no appreciable improvement in the conditions of trade during the past week. This is due largely to the fact that unseasonably warm weather has prevailed over almost the entire country, and that the near approach of the presidential election has caused general conservatism. The weather conditions have prevented retail merchants from disposing of their stocks of winter goods, and this has made an unusually light fall trade in wearing apparel. In groceries and other necessities there has been only an average trade on account of popular economy, and the fact that in many sections there are still large numbers of workmen unemployed. In the cereal growing and agricultural districts there seems to be plenty of money and collections are distinctly better. On the other hand, in some sections of the West it has been too dry for winter wheat seeding, and this has acted, in some measure, to discourage farmers from branching out. In industrial centers, there seems to be very little improvement, although it is said that in some lines in the iron trade more employees are at work. The drought, causing low water in navigable streams, has tended to reduce the output of coke and coal, and in some sections to inconvenience seriously the paper making industry. Railway tonnage is increasing steadily, and the number of idle cars is being reduced further. Current reports of earnings show smaller decreases in gross and net earnings and are generally more satisfactory. For the future universal hopefulness is expressed by jobbers and wholesalers because of the light stocks which are known to be held all over the country. It is believed that after the election buyers will be plentiful, and that the present hand-to-mouth system of ordering will be discontinued. It is known that many new enterprises are being held in abeyance, and these are expected to be started as soon as the election excitement is over. Cotton picking in the South has progressed very rapidly, and the reports from gins are far in advance of those of last year. Some deterioration in the crop in the Carolinas, Georgia and Florida is reported but the yield will still total more bales than in 1907. There is a disposition on the part of some growers to hold back the staple owing to the fact that prices are 2½ to 3 cents lower than they were at this time last season. Organizations of planters throughout the South are urging this course, and in some sections there have been outbreaks of violence where individual growers refused to hold their cotton. The apparent settlement of the Balkan situation in Europe has slightly weakened the prices of wheat, although the unfavorable weather has done much to sustain them. It is now generally believed that there will be no war and the grain market is therefore depending upon the customary conditions. There are some inquiries coming forward for railway material, especially for light steel rails, and specifications for cars are reported in fairly good volume. Business in structural material is somewhat better than it has been, but is still far behind that of last year. The bulk of the new orders comes from railways for bridge material. Building continues to look up in some sections of the South and far West, and the lumber trade continues to thrive. Business failures for the week ended Oct. 15, as reported by *Bradstreet's*, number 244, against 256 for the previous week, 194 in the like week of 1907, 170 in 1906, 178 in 1905 and 227 in 1904.

THE COPPER MARKET.

It begins to appear clear that prices of copper will not go lower. The strong interests in control of the situation, having made a stand at 13 to 13½ cents and checked every effort to depress the market further throughout the long period of heavy production and light consumption, can certainly be depended upon to stand firm from now until after election. It is confidently expected that consumers will come into the market by the middle of November and that large sales will be recorded. Among the sellers in this market it is asserted that orders for more than 50,000,000 lb. are being held up and that they will be placed before Dec. 1. Small orders are also anticipated in large volume and altogether the copper men are in a comfortable frame of mind. The electrical manufacturing concerns are known to have many orders pending and it is also fairly well known that their stocks of metal are light. Reports from brass manufacturers are equally encouraging and even at the present time their business is showing considerable increase. Although the greater part of this optimism is for future delivery, the past week showed considerable improvement in actual sales. Contracts were made for moderate tonnages of electrolytic copper, to be delivered before the close of October and early in November. Orders were reported for New England consumers of between 5,000,000 and 6,000,000 lb. and altogether it is estimated that betwen 10,000,000 and 12,000,000 lb. were disposed of in this market. This business was taken mostly by brass manufacturers and wire drawers and is said to have averaged about 13¼ cents for electrolytic. The disappearance of the war scare in Europe has done much to brace up that market. During the flurry considerable copper is said to have been disposed of at prices ranging around 13⅛, but prices have since become firmer, and it would probably be hard to buy any large quantity at the present time at less than 13½. Sales are being made now for November and December delivery at slight advances over spot quotations. The United States Government order which was placed during the week was secured principally by the United Metals Selling Company. The orders placed were 100,000 lb. of electrolytic for the Portsmouth navy yard, 200,000 lb. of electrolytic for the Boston navy yard, 300,000 lb. electrolytic for Philadelphia, 200,000 lb. electrolytic for Norfolk, all to the United Metals Selling Company at 13½ cents per lb., 250,000 lb. of "best" lake for the ordnance department to the United Metals Selling Company at 13¼ cents per lb., 500,000 lb. of lake to the ordnance department at 13⅝ cents per lb. to the United Metals Selling Company, and 500,000 lb. of electrolytic for the Brooklyn navy yard at 13½ cents to the American Metals Company. Altogether 2,050,000 lb. were placed at the uniform price of 13½ cents for electrolytic and 13⅝ cents for lake. In the case of the Brooklyn business, three companies were tied, and in the "best" lake the Quincy Mining Company was tied with the United, and the matter was settled by drawing lots. The management of the Nevada Consolidated Copper Company and of the Cumberland-Ely Copper Company have made a joint contract with the American Smelting & Refining Company for the disposition of their output for one year. The terms are said to be a commission of 1 per cent with settlements upon actual sales of copper. This contract makes the Guggenheim company a large factor in the disposition of copper. The two companies are now producing at the rate of 20,000,000 lb. per year, but it is expected that the output will be increased to 60,000,000 lb. before very long. It is also predicted that the Guggenheim concern will secure the selling contract for the Utah Copper Company, amounting to 4,500,000 lb. per month, when its contract with the United Metals Selling Company expires next February. During the first half of October imports were somewhat smaller than in September and it now seems likely that the total for the month will not exceed 8,000 tons. Exports, on the other hand, are better, owing to the improved condition of the European market. For the month including Oct. 19, exports have been 13,881 tons. Quotations on the Metal Exchange on the same date were:

Lake	13¾ @ 13⅝
Electrolytic	13⅛ @ 13⅜
Castings	12⅞ @ 13⅛

The London market was as follows:

	Noon. £	s	d	Close. £	s	d
Standard copper, spot	59	8	9	59	8	9
Standard copper, futures	60	5	0	60	5	0
Market	Easy.			Quiet.		
Sales of spot				300 tons		
Sales of futures				600 tons		

Extreme fluctuations for this year:

	Highest.			Lowest.		
Electrolytic copper, spot	13¾			12¼		
Lake copper, spot	13⅞			12⅜		
Casting copper, spot	13½			12⅛		
London, spot	£64	5	0	£56	5	0
London, futures	64	10	0	56	17	6
London, best selected	67	10	0	60	0	0

BIG CONTRACT FOR COMMONWEALTH EDISON COMPANY.—It is announced in Chicago that the Chicago City Railway Company has concluded a contract with the Commonwealth Edison Company under which it will purchase all of its electric current from that company for the next 10 years and will abandon the power producing stations it is operating at the present time. The signing of the contract only awaits the formal approval of the Board of Supervising Engineers, the members of which have already unofficially recommended the plan. The contract will be the largest ever made in Chicago for electricity. At the beginning of the term, according to Samuel Insull, president of the Commonwealth Edison Company, it will cost the railway $800,000 or $900,000 annually, and at the end between $1,300,000 and $1,400,000 each year. At present the street car company secures slightly less than three-fourths of its motive power from the same company under a less favorable five-year contract. The street car company will retain its transforming stations.

AFRICAN LIGHTING SYSTEM.—The U. S. Bureau of Manufactures, Washington, D. C., states that, according to advices from an American consul in Africa, tenders are invited by a certain municipal corporation for the installation of an electric lighting system for the purpose of lighting the streets and public buildings. The streets are to be lighted partly by arc and partly by incandescent lamps, charges to be reckoned per 1000 volts. Apart from the churches, schools, colonial, imperial and naval buildings, it is thought that owners of many private houses will avail themselves of the opportunity of entering into arrangements with the successful tender. All tenders should be sealed and forwarded to a certain official so as to be received not later than Nov. 1, 1908. The case is No. 2694 and further details can be obtained from the Bureau.

STORE LIGHTING WITH NERNSTS.—The G. M. McKelvy Company, of Youngstown, Ohio, has placed an order with the Nernst Lamp Company for the new Westinghouse Nernst lamps for the entire lighting of its new four-story building, to be occupied next month. The installation will consist of 36 three-glower lamps for the first floor, 69 two-glower lamps for the second and third floors and 75 132-watt lamps for the basement and fourth floor. This is the largest department store in Youngstown. The building now occupied by the McKelvy Company has been lighted by the old style Nernst lamps for several years.

ONEONTA & MOHAWK VALLEY ROAD SOLD.—The Oneonta & Mohawk Valley Railroad, an electric line connecting Herkimer and Oneonta, N. Y., was sold at auction Oct. 9 to Joseph A. Starrett, who gave his address as 1231 Stebbins Avenue, New York. The sale was made under mortgage foreclosure brought by the Knickerbocker Trust Company, of New York. Mr. Starrett was the only person present who qualified to bid, and his first offer of $200,000, the minimum figure set by the order of the court, was accepted by the referee. It is said that he was acting for Herbert T. Jennings, who constructed the line.

NEW WORKS FOR TRIUMPH ELECTRIC COMPANY.—Bert Baldwin & Company have completed plans for the new plant of the Triumph Electric Company, at Cincinnati, and bids will be asked within a short time for two of the buildings, the machine shop and warehouse. The shop will be 300 ft. long and 140 ft. wide, while the warehouse will be 200 ft. x 60 ft. in dimensions, both two stories high. The other portions of the plant will be erected later on, but it is stated that the two buildings will entail an outlay of about $100,000.

MEXICAN TRANSMISSION LINE.—Siemens-Schuckert Werke, of Berlin, Germany, one of the leading electrical concerns in the empire, has the contract for a large plant at Guadalajara, Mexico, and has to complete the installation under rush orders. It is now calling for tenders in this country on the steel transmission towers. The specifications are for a three-phase system. The line is 184 km in length, and the average distance between towers 150 m. The system is three-phase, and the wires are separated 2 m.

OVER THE MOUNTAINS BY ELECTRICITY.—Sir Thomas Shaughnessy, president of the Canadian Pacific, declares that one of the reasons for recently voting $50,000,000 of new stock for his road is that it intends to establish electric service over the Rocky Mountains. The power is to be generated by water plants, and the amount of track to be ultimately electrified is 700 miles.

Financial Intelligence.

THE WEEK IN WALL STREET.

The course of the stock market during the week ended Oct. 19 has been more or less erratic and trading has been very light. In the early days of the week an effort was made, apparently by professionals, to depress prices. As this effort proved futile the market advanced, and seemingly those responsible for the advance were the same individuals who had previously been on the bear side. There has been no occasion for depression when the fact is taken into consideration that the market is being well supported by strong interests. The Balkan war scare, which did so much a fortnight ago to demoralize the European exchanges, causing active selling of American securities by foreign holders, has apparently subsided. At least, during the week under review there has been no disposition in Europe to sell American stocks, and Wall Street has not been called upon, therefore, to absorb foreign holdings. This of itself is a great relief because there are few domestic sellers and absolutely no pressure to dispose of stocks. With the foreign selling out of the way home conditions are not only encouraging but have a buoyant tendency. Chief among these conditions is the belief that the election of Mr. Taft is practically assured. This is taken to mean an immediate investment and development in various lines of railroad and industrial enterprise. It is a well known fact that many extensive trade contracts are being held pending the election. The only disturbing element that can be attributed to the political situation is the fact that trade in commercial lines seems to be held in abeyance until after election. Probably the most interesting feature of the entire Wall Street market, and certainly the most encouraging, is the strength in the prices of good bonds. The bond market has been strong for months, and at the present time it is in the condition where any reasonable security offering fair returns is immediately taken up. This was demonstrated within the past few days by the subscription to $14,500,000 Southern Pacific 4 per cent. refunding bonds. This issue was taken within a few days after it was placed on the market. In addition to that the Street took at once $12,000,000 of the City of New York's one year revenue warrants at a price which makes the interest to the city only a little more than 4 per cent. It was stated by one financial authority that during the week trades were made in 224 different issues of bonds. These included many of the best railroad and industrial issues and the prices were generally advancing. Large financial institutions are taking these bonds as temporary investments for idle capital, feeling confident of the early return of prosperity, and certain that the prices of good securities will be higher next year than at the present time. While railroad earnings are still below those of last year, the average

NEW YORK.

	Oct. 12.	Oct. 19.	Shares Sold.		Oct. 12.	Oct. 19.	Shares Sold.
All.-Ch.	11⅜	11⅝	4,650	Int.-Met., pfd.	32⅝	29¼	3,310
All-Ch., pfd.	35½	35⅞*	6 900	Mackay Cos.	68*	73¾	7,210
Amal. Cop.	75⅝	75¼	57,450	Mackay Cos.,pfd.	68½*	69¾	1,400
Am. D. T.	35*	35*	——	Manhattan Elev.	137*	137	30
Am. Loc.	49	49	10,935	Met. St. Ry.	28	28*	500
Am. Loc., pfd.	105	105*	100	N.Y.&N.J. Tel.	116*	117	——
Am. Tel. & Cbl.	71*	71*	——	Steel, com.	47	46¼	245,850
Am. T. & T.	127¾	127	7,725	Steel, pfd.	109⅞	108⅞	12,245
B. R. T.	48¾	48¼	9.410	W. U. T.	58½	58½	1,372
Gen. Elec.	143	144½	2,700	West'h, com.	75⅜	82	37,870
Int.-Met., com.	10⅝	10¼	1,510	West'h, pfd.	88*	100	300

PHILADELPHIA.

	Oct. 12.	Oct. 19.	Shares Sold.		Oct. 12.	Oct. 19.	Shares Sold.
Am. Rys.	44½*	44½	——	Phila. Elec.	10¼	11	——
Elec. Co. of A.	9⅞	9⅞*	——	Phila. R. T.	23⅜	23	——
Elec. Stor. B'ty	35½	35½	——	Phila. Traction.	90	90	——
E. S. B'ty, pfd.	49	49	——				

CHICAGO.

	Oct. 12.	Oct. 19.	Shares Sold.		Oct. 12.	Oct. 19.	Shares Sold.
Chi. City Ry.	176*	176*	——	Chi. Tel. Co.	125	124	——
Chi. Rys., Ser. 1	—	104½	——	Met. El., com.	12¾*	12¾*	——
Chi. Rys., Ser. 2	—	42⅛	——	Nat'nal Carbon.	69*	69*	——
Com. Edison	108	109¼	——	Nat. Carb., pfd.	109*	109*	——
Chi. Subway	19*	19*	——				

BOSTON.

	Oct. 12.	Oct. 19.	Shares Sold.		Oct. 12.	Oct. 19.	Shares Sold.
Am. Tel. & Tel.	127	127¼	——	Mass. E. R.,pfd.	52*	51*	——
Com'bind Tel.	120	122	——	Mex. Tel., pfd.	6*	6*	——
Gen. Elec.	143	145	——	N. E. Tel'p.	122	122	——
Edison El. Ill.	230*	230*	——	W. Tel. & Tel.	8*	8*	——
Mass. Elec. Ry.	10¼*	10*	——	W. T. & T., pfd.	80*	75	——

* Last price quoted.
Shares sold are for week Oct. 12 to Oct. 17.

of decrease is very much smaller than a few months ago. It is estimated from the recent weekly returns of 12 of the most prominent roads that the decrease in gross in comparison with last year is less than 10 per cent. The decrease in net will not be so great because of the rigid economies which the lines have introduced. Crop conditions continue to be satisfactory and, while returns from industrial centers do not show any considerable development in business, reports show that there were many inquiries and that the prospects for future orders are very bright. The money market during the week has been appreciably firmer. Loans have been made more freely, and the rates have advanced slightly. On Oct. 19 call loans were quoted at 1¼@1¾ and 90-day funds were quoted at 3@3½. The quotations in the table are of the close Oct. 19.

DIVIDENDS.

Twin City Rapid Transit Company (Minneapolis), common, quarterly, 1¼ per cent, payable Nov. 14.

Milwaukee Railway & Light Company, preferred, quarterly, 1½ per cent, payable Oct. 31.

United Electric Securities Company, preferred, semi-annual, 3½ per cent, payable Nov. 2.

Michigan Telephone Company, preferred, quarterly, 1½ per cent, common, quarterly, 1 per cent. Preferred, payable Feb. 1.; common, payable Dec. 1.

Grand Rapids Railway Company, preferred, quarterly, 1¼ per cent, payable Nov. 2.

Havana Electric Railway Company, preferred, quarterly, 1½ per cent, payable Nov. 14.

Amalgamated Copper Company, quarterly, ½ per cent, payable Nov. 30.

Georgia Railway & Electric Company (Atlanta), preferred, quarterly, 1¼ per cent, payable Oct. 20.

East St. Louis & Suburban Company, preferred, quarterly, 1¼ per cent, payable Nov. 2.

Columbus (Ohio) Railway Company, preferred, quarterly, 1¼ per cent, payable Nov. 2.

American District Telegraph Company of New Jersey, quarterly, 1 per cent, payable Oct. 22.

West Penn Railways Company (Pittsburg), preferred, quarterly, 1¼ per cent, payable Nov. 2.

Electrical Securities Corporation, preferred, semi-annual, 2½ per cent, payable Nov. 2.

Butte Electric & Power Company, preferred, quarterly, 1¼ per cent, payable Nov. 2.

Montreal Street Railway Company, quarterly, 2½ per cent, payable Nov. 2.

WESTINGHOUSE COMPANY SEEMS TO BE OUT OF TROUBLE.—There now seems to be every prospect that the Merchandise Creditors plan for rehabilitating the Westinghouse Electric & Mechanical Company will be fully adopted and put into operation when the Readjustment Committee meets Oct. 27. Since the last meeting of that committee the assent of creditors to the stocktaking plan has been liberal and a number of additional stockholders have subscribed to assenting stock. The banks, especially those of New York, have evinced a willingness to settle their claims on easy terms. In New York the National Park Bank, Chase National Bank, National Bank of Commerce and the New York Life Insurance & Trust Company have agreed to accept settlement by taking 50 per cent of their claims in convertible bonds and 50 per cent in the new assenting stock. This practically clears up the New York bank debt and as many banks in Pittsburg and other places have already agreed to compromise their claims, this end of the plan is a success. Among the merchandise creditors almost the entire amount has been subscribed. At the last meeting of the Readjustment Committee in September there still remained unsubscribed $1,500,000 of the $6,000,000 to be taken by the shareholders. Some portion of this has been taken since that time, and it is said that Mr. George Westinghouse has made arrangements to take up any portion not taken by the stockholders. It is now confidently predicted that before the end of the year the management of the property will be returned to the stockholders and the receiver discharged. This confidence has been reflected in Wall Street where both issues of the stock are very strong while the bonds have advanced to 87¼. It is generally understood that even at the advance little stock is coming out and it is estimated that 50,000 shares would more than cover the available supply. Sales of the company are showing some improvement, the September business being placed at $2,000,000. As the reorganization plan was based on estimated yearly sales of $20,000,000, the figures for September are very encouraging. It is said that at the present time the company is employing about 9,500 men, which compares with 16,000 when the plants were running at full capacity in 1907.

NEW FINANCING PLAN FOR HUDSON TUNNELS.—A new plan for completing the unfinished portions of the tunnels and the terminal and transportation facilities of the Hudson companies has been submitted to the preferred stockholders of that company. The new plan provides for the payment by the Hudson companies of $7,379,681 to the Hudson & Manhattan Railroad, which is the operating concern, and thereby relieving itself of all further obligation to complete the construction. The railroad company undertakes to complete the work under the revised plan, which does not include completing the line to Thirty-third Street or building the Ninth Street crosstown line at present. The Hudson companies will obtain the money needed for this payment by an issue of $5,000,000 3-year 6 per cent notes at par and the sales of the Thirty-third Street terminal property for $3,000,000. The notes will be offered first for subscription to the preferred stockholders. In case they do not care to avail themselves of the privilege it is understood that they will be taken up by other interests. Inasmuch, however, as a 100 per cent bonus in common stock of the railroad company goes with the notes, it is believed that the preferred stockholders will exercise their full rights to subscribe, which are 35 per cent of the par value of their stock. The notes will be secured to the extent of 150 per cent of their face value by bonds of the Hudson & Manhattan Railroad Company. In submitting the new plan Mr. William G. McAdoo, president of the company, has submitted an estimate of the railroad's earnings as follows: Receipts from passengers (77,000,000 passengers per annum), $3,850,000; operating expenses, $1,540,000; net from passenger traffic, $2,310,000; net income from terminal buildings, $1,200,000; income from baggage, advertising in cars, etc., $300,000; total, $3,810,000.

BOSTON ELEVATED CONSOLIDATION PLANS.—In the proposed consolidation of the Boston Elevated Railway Company and the West End Street Railway Company there has arisen a difficulty over terms which has caused delay. The hitch represents an effort on the part of some of the largest holders of West End common to secure more advantageous terms than the new law affords. At the present time holders of West End common have a guaranteed 7 per cent stock, which legally ranks on a parity with the debenture bonds of the Boston Elevated so far as security of principal is concerned. They are asked to transfer this stock into Boston Elevated second preferred, paying 7 per cent, but ranking after Boston Elevated bonds. In the event of the placing of a mortgage on the property the security of the principal would be still further diminished. The movement which is now under way has for its object the obtaining for West End common stockholders a security of principal equal to that now possessed as a guaranteed stock of a leased road and an increase in the dividend rate from 7 per cent to 8 per cent.

EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON.—The report of the Edison Electric Illuminating Company of Boston for the year ended June 30, 1908, shows material gains and the surplus on the year's operations is more than double that of the previous year. The gross earnings were $4,229,239, compared with $4,020,620, expenses involved $2,261,344, compared with $2,116,178 previously, leaving net profits of $1,967,895, compared with $1,904,441. The general balance sheet, as of June 30, showed total assets of $23,490,621, compared with $23,442,388 on June 30, 1907, and $20,511,823 of June 30, 1906. At the annual meeting of stockholders the old directors were re-elected except that Mr. C. F. Adams, 2d, was chosen to succeed Mr. Robert Bacon, resigned.

SUES FOR TELEPHONE BONDS.—The Consolidated Telephone & Telegraph Company, of Trenton, N. J., has brought a bill in court against the International Trust Company and others, seeking to get possession of bonds worth $214,000, the balance of an issue of $300,000 remaining unsold, and the books and papers of the corporation. It alleges that the property is in the possession of the company, Alfred S. Hayes and L. S. Nixon. The plaintiff alleges that, under a decree of the court of New Jersey, Nixon and others were directed to give up the books and papers to the lawful directors.

WESTERN UNION'S EARNINGS DECREASE.—The report of the Western Union Telegraph Company for the year ended June 30, 1908, shows a heavy decrease in both gross and net earnings. Business depression and the operators' strike are held responsible for the falling off. The company's gross revenues for the year were $28,582,212, or $4,274,194 less than those for the previous year, while its operating and general expenses, including taxes, were $19,069,813, or $187,809 smaller than those for the preceding year. Its rentals, leases and loans, however, reached $1,546,182, or $611 more than those for the previous year, but its maintenance and reconstruction accounts involved $4,139,358, or $1,138,935 less than those for the preceding year, while its equipment expenditures amounted to $423,862, or $26,848 less than those for the previous year, making total expenses of $25,179,215. The deduction of these total expenses from the gross revenues left a net revenue of only $3,402,997, or $2,921,213 less than that for the fiscal year ended June 30, 1907. Interest on bonds involved $1,732,250, or $312,189 more than that for the previous year, leaving a balance available for dividends of $1,670,747, or $3,233,402 less than that for the previous year. The cash dividend disbursements were reduced by $3,153,524 to $1,714,572, but, even after this big reduction in the amount so disbursed, there remained a deficit for the year of $43,825, compared with a surplus of $36,053 for the previous year. The total surplus was $16,840,956, or $43,825 less than that for the preceding year, and the deduction from this total surplus of $2,447,100 in stock dividends left a final surplus of $14,393,856, or a cut of $2,490,925. In his report to the stockholders President Robert C. Clowry says: "The net growth of the plant was: in poles and cable 2831 miles; in wire 38,231 miles; in offices there was a decrease of 907, due principally to the fact that railroad companies have closed many small telegraph offices in consequence of the enactment of laws shortening the hours of labor. At most of such places messages are accepted and telephoned to an office of this company to be forwarded to destination. Of the total of 1,359,430 miles of wire at the close of the year 485,801 were of copper and 873,629 of iron; an increase in copper of 66,351 and in iron a decrease of 28,120 miles during the year, due to the substitution of copper for iron." The total number of messages decreased 12,433,264 during the year although the average toll per message was about the same as previously. The cost of transmission was increased during the strike period but became normal after the trouble was settled. At the stockholders' meeting Paul Morton and Robert M. Gallaway were elected directors to succeed Morris K. Jesup and J. D. Layng.

E. H. GAY & COMPANY IN BANKRUPTCY.—A petition in bankruptcy was filed against E. H. Gay & Company, in Boston, on Oct. 17, by judgment creditors. The firm does a banking and broker business with offices in both Boston and New York. On Oct. 7 default was made in the payment of interest on $15,000,000 bonds of the Hudson River Electric Power Company, and since that time Adelbert L. Reynolds has been acting as agent for E. H. Gay & Company, under power of attorney. Mr. Reynolds declares that he has been acting in the interest of all the creditors and not representing a few. In detailing the condition of the concern he said: "E. H. Gay & Company have a number of gas, power and traction companies among their assets, several of which are very good properties. Of these some must be worked out and some are complete operating companies to-day. The two properties which have been the heaviest burden for Gay & Company are the Hudson River Electric Power Company and the Pittsburgh, Binghamton & Eastern Railroad."

ALLIS-CHALMERS BONDS APPLY FOR LISTING.—In its application for the listing of $10,325,000 first-mortgage 5 per cent bonds on the New York Stock Exchange, Vice-President W. W. Nichols, of the Allis-Chalmers Company, says: "On any interest date after July 1, 1916, these bonds may be redeemed at 110 per cent of the face value and interest accrued to the date of redemption, specified in a notice of redemption to be published for four successive weeks, and all bonds thus redeemed are to be canceled by the trustee." These bonds were offered to the holders of the common and preferred stocks at 80 per cent, par value, and bonds not subscribed for were sold to a syndicate which was dissolved Jan. 1, 1908. The bonds are now selling at from 78 to 78¾.

SPRINGFIELD, OHIO, ELECTRIC COMPANIES CONSOLIDATE.—The stocks, common and preferred, of the People's Light, Heat & Power Company, of Springfield, Ohio, are being deposited with the Capitol Trust Company, of Columbus, Ohio, for exchange for the securities of the Springfield Light, Heat & Power Company, which is a merger of the People's and Home Lighting, Power & Heating Company, known as the Kelly plant. The papers transferring the Kelly property to the new company were signed several days ago and the deal is closed to all intents and purposes. Subscribers to the new capital stock are paying in their subscriptions, and as soon as the old stock is all in the exchange will be made and the details will be completed.

MORGAN OUT OF BOSTON EDISON.—It is said that J. Pierpont Morgan has practically sold all of his large holdings in the Edison Electric Illuminating Company of Boston. A year ago at this time the stockholders' list showed that Mr. Morgan held 3410 shares of stock, worth at that time about $630,000. Mr. Morgan sold his stock several months ago, and the weakness in the stock was due to the liquidation of this comparatively large amount in a narrow market.

CLEVELAND TO GET TRACTION PROFITS.—The stock of the Municipal Traction Company of Cleveland, which has been operating the street railway lines of the city under lease, was placed, Oct. 12, in the hands of the trustees, who are pledged to use the profits in betterments or in aiding other municipal projects such as lighting plants.

REPORTS OF EARNINGS.

	Gross Earnings.	Operating Expenses.	Net Earnings.	Charges.	Surplus.
Western Union Telegraph Company:					
Year ended June 30, 1908	$28,582,212	$25,179,215	$3,402,997	$1,732,250	$1,670,747
Year ended June 30, 1907	32,856,406	26,532,196	6,324,210	1,420,061	4,904,149
Edison Electric Illuminating Company of Boston:					
Year ended June 30, 1908	4,229,239	2,261,344	1,967,895	397,584	1,608,751
Year ended June 30, 1907	4,020,620	2,116,178	1,904,441	453,479	1,492,302
American Telephone & Telegraph Company (income account):					
September, 1908	1,303,904	172,660	1,131,244	614,215	517,029
September, 1907	1,168,773	131,827	1,036,946	651,574	651,574
West Jersey & Seashore Railroad Company:					
August, 1908	717,888	339,975	377,931	17,112	382,207
August, 1907	898,697	413,293	485,404	17,112	468,291
Mexican Telegraph Company:					
August, 1908	32,492	17,881	14,611	.....	.....
August, 1907	31,270	16,871	14,399	.....	.....
Fairmont & Clarksburg (W. Va.) Traction Company:					
August, 1908	37,908	12,356	25,552	1,072	26,808
August, 1907	34,794	14,825	19,969	945	20,254
Portland (Me.) Electric Company:					
Year ended Aug. 31, 1908	304,951	124,871	180,080	.....	73,802
Year ended Aug. 31, 1907	289,736	125,490	144,246	.....	44,191
United Railways Company of St. Louis:					
September, 1908	887,344	554,164	333,180	234,380	98,800
September, 1907	930,606	588,883	341,723	232,404	109,319

GENERAL NEWS

Construction News.

DEMOPOLIS, ALA.—The Demopolis Telephone Company is making arrangements to improve its telephone system, which will include the erection of several thousand yards of cable and installation of an additional switchboard.

ROGERS, ARK.—The Rogers Light & Power Company, it is reported, contemplates extending and improving its electric light system.

DELANO, CAL.—Application has been made to the Board of Supervisors by Edwin Alderson for a franchise to operate an electric lighting system in Delano, bids for which will be received until Dec. 5.

GRASS VALLEY, CAL.—Charles C. Haub, who is interested in several mining companies in this district, is reported to be contemplating the erection of a 10-stamp mill and installation of electrical machinery.

GREENVILLE, CAL.—Plans are being made to establish an electric light plant in Greenville, to be in operation by Jan. 1.

MODESTO, CAL.—The La Grange Water & Power Company has purchased the franchise for furnishing the city of Turlock with electricity for lamps, motors and heat, and will commence work immediately on the extension of its transmission lines to Turlock.

RED BLUFF, CAL.—It is reported that the Northern California Power Company will soon commence work on the construction of a new power plant on the Hazen place. E. D. V. Johnson is manager.

SAN FRANCISCO, CAL.—Plans are being made by the Pacific Coast Company for the construction of large coal bunkers and coal handling apparatus, to be operated by electricity. The company intends to install a large electric plant in connection with the proposed improvements.

STOCKTON, CAL.—Harry T. Compton, consulting engineer, who was engaged by the Southside Promotion Committee to investigate the project of installing electric motors to be used for irrigation purposes has submitted a report advising the use of electricity in connection with the work.

TURLOCK, CAL.—The La Grange Water & Power Company has been granted a franchise to construct an electric light and power plant at Turlock, with the privilege of erecting transmission lines in the eastern part of Stanislaus County.

WATSONVILLE, CAL.—The City Council has voted to have the telephone wires placed underground in certain districts in the city.

YREKA, CAL.—Arrangements are being made by the owners of the Klondike Mine on Ash Creek to construct an electric plant to operate the Huntington Mill. It is proposed to construct a ditch 1000 ft. long to divert the water from the Klamath River to operate the plant. A 150-kw generator will be installed and the plant will furnish electrical energy to several mines in that vicinity. J. W. Downing is interested in the project.

CANON CITY, COL.—Work has commenced on the construction of power conduit, pipe, ditch and tunnel in connection with a water power development of Grape Creek, to furnish power for a hydro-electric plant, the water to be returned to the creek to be used for the irrigation of several thousand acres in township nineteen, south of this city. The water will be taken from De Weese reservoir, on Grape Creek, 16 miles above Canon City. The work will involve an expenditure of about $425,000. D. De Weese is interested in the enterprise.

DENVER, COL.—The Continental Mines, Power & Reduction Company has erected a hydro-electric plant and transmission lines to furnish electrical energy to operate its system and will also furnish electricity for operating the mines and mills in Creek County. Henry I. Seemann is president and general manager of the company.

DENVER, COL.—The Eastern Colorado Power Company is planning to build a large storage reservoir on Middle Boulder Creek, several miles above Boulder, the cost of which is estimated at $1,500,000. The above-named company is a subsidiary of the Central Colorado Power Company, which is now building a tunnel and hydro-electric power plant near Glenwood Springs and transmission line from near Glenwood Springs to Denver for the distribution of electricity in this city.

ESTES PARK, COL.—Plans are being made to establish a large hydro-electric plant in Estes Park. It is proposed to erect the power house near the fish hatchery. The plant will furnish electricity for lamps for the buildings in the park and also for heating the hotel. F. O. Stanley is manager of the Estes Park Hotel.

NEW HAVEN, CONN.—Plans are being prepared for the installation of a central electric lighting plant to supply electricity for lamps for all the Yale University buildings and dormitories, except where plants have already been installed. It is proposed to use the Yale dining-hall plant and equipment of the Sheffield Scientific School plant with necessary changes and improvements. The cost of the plant is estimated at about $50,000.

NEW HAVEN, CONN.—Bids will be received until Oct. 27 by the Boards of Police and Fire Commissioners for furnishing the following material: 960 ft. of 75-wire cable and 460 ft. of 50-wire cable, the wires to be No. 14, B. & S. gage, of pure, soft drawn copper and thoroughly tinned. Insulation to be 5/32; compound to be the best Para rubber used for underground insulation. A. V. Phillips is clerk of the Board of Police Commissioners and S. J. Metzer is clerk of the Board of Fire Commissioners.

WASHINGTON, D. C.—The stockholders of the Washington, Baltimore & Annapolis Electric Railway Company have authoriezd an increase in the capital stock of the company from $5,250,000 to $6,000,000. George T. Bishop is president of the company.

WASHINGTON, D. C.—The contract for furnishing four 1000 and two 500 kw turbo-generator sets for the navy yards at New York, Philadelphia, Norfolk, Va., Mare Island, Cal., and Bremerton, Wash., has been awarded to the Westinghouse Machine Company, of Pittsburg, Pa.

WASHINGTON, D. C.—Bids will be received at the office of the superintendent U. S. Capitol Building and Grounds, Washington, D. C., until Oct. 24 for furnishing three electrically operated dumbwaiters in the office building of the U. S. Senate, Washington, D. C. The entire work is to be completed by Dec. 19, 1908. Elliott Woods is superintendent.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 27 for furnishing at the Naval Academy, Annapolis, Md., a quantity of naval supplies, as follows: Schedule 446—electrical wire, etc. Schedule 449—electric and exhaust fans, etc. Applications for proposals should designate the schedules desired by number. Blank proposals will be furnished upon application to the Navy Pay Office, Baltimore, Md., or to the bureau. E. B. Rogers is paymaster-general, U. S. N.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Nov. 21, for additions and alterations in the navy buildings, Philadelphia, Pa., including the installation of switchboards, distributing system for lamps and motors, conduits, telephone and alarm systems, lighting fixtures, lamps, etc.; also two electric elevators to be operated by three-phase, 60-cycle, 220-volt motors. An appropriation of $100,000 has been made for the entire work. Plans and specifications can be obtained on application to the bureau or to the commandant of the navy yard named. William M. Smith is acting chief of bureau.

FLORESVILLE, FLA.—The City Council is reported to have granted to F. Largen and associates a franchise to construct and operate an electric light plant.

OCALA, FLA.—Plans are being made for extensive additions to the municipal electric lighting system.

PORT INGLIS, FLA.—Plans are being considered for the development of Withlacoochee River, the power to be used to generate electricity for lamps and motors. W. N. Camp, of Ocala, Fla.

ATLANTA, GA.—The Atlanta Northeastern Railroad Company has been authorized to issue $1,200,000 in stocks and bonds to construct its proposed railway from Atlanta to Cummings, Ga., a distance of 42 miles. T. F. Martin and J. L. Murphy are interested in the enterprise.

LAFAYETTE, GA.—An election will soon be held to vote on the proposition to issue $10,000 electric light bonds.

LAVONIA, GA.—W. N. Edwards is interested in a project to erect a power plant in Lavonia, the cost of which is estimated at from $15,000 to $20,000.

SUWANEE, GA.—Investigations are being made with a view of developing the water power at Suwanee Falls, on the Suwanee River. D. G. Zeigler, 530 Edgewood Avenue, Atlanta, Ga., consulting engineer, is interested in the enterprise.

WAYCROSS, GA.—It is reported that J. E. Wadley, president of the Waycross Electric Light & Power Company, has submitted a proposition to the City Council offering the entire electric light plant to the city with present contracts for $50,000. It is said that if the city does not purchase the plant the company will enlarge and improve the system.

BONNERS FERRY, IDAHO.—Arrangements are being made by J. S. Drumheller, of Spokane, Wash., for the construction of a hydro-electric plant at Moyie Falls, eight miles from Bonners Ferry. The plant will furnish electricity in Sandpoint, Bonners Ferry and the mines within 50 miles of the falls. J. F. Reynaud, of Sandpoint, will have charge of construction of the plant.

SAINT MARIES, IDAHO.—The Interstate Telephone Company is rebuilding the local telephone system and replacing the old wires with cables.

CHICAGO, ILL.—The contract for installing electrical equipment in two substations for the city has been awarded to Pasches Brothers, 115 Dearborn Street, Chicago, Ill., for $19,346. Willaim Carroll is city electrician.

CHICAGO, ILL.—The Cosmopolitan Electric Company is planning to construct a large power plant at Chicago River, Grove and Sixteenth Street, at a cost of $300,000. D. H. Burnham & Company, Railway Exchange Building, Chicago, Ill., are the architects.

IPAVA, ILL.—The Ipava Woolen Mills & Electric Light Plant, recently purchased by the Scripps-Greer Company, will be placed in operation as soon as necessary arrangements can be made.

CRAWFORDSVILLE, IND.—The capital stock of the Home Telephone Company, of Crawfordsville, has been increased from $15,000 to $100,000.

ELKHART, IND.—The St. Joseph Valley Railway Company has applied to the City Council for a franchise to construct a street railway on East Jackson Street to the city limits.

FRANKFORT, IND.—The City Council has granted a franchise to the Kokomo, Frankfort & Terre Haute Traction Company for a right of way through this city.

INDIANAPOLIS, IND.—Bids will be received by the Trustees of the Indiana Girls School, 804 Lemcke Building, Indianapolis, Ind., until Oct. 29, for wiring and installing electric fixtures, etc., in the Girls' School. John B. Elam is president.

MILFORD, IND.—The streets and business houses of this city have been in darkness for a week or more because of the poor and inadequate service furnished by the Syracuse Lighting Company. The officials of the company state that the plant will be rebuilt and re-equipped in a short time.

OSSIAN, IND.—The Town Board has granted a franchise to the Fort Wayne & Wabash Valley Traction Company to furnish electricity for lighting the streets and residences of the town. A substation will be erected in Ossian.

TERRE HAUTE, IND.—It is reported that the Terre Haute & Merom Traction Company has been reorganized and has decided to resume work on construction of the railway from Terre Haute to Merom. About 11 miles of grading has been completed south of Terre Haute. W. S. Roney, of Terre Haute, and G. R. Hammond, of Merom, Ind., are directors of the company.

WABASH, IND.—Extensive improvements and additions are contemplated by the Wabash Water & Light Company, which will involve an expenditure of about $50,000.

CEDAR RAPIDS. IOWA.—Local parties have filed an application for a franchise to construct a large dam across the Cedar River at Palisade, a few miles below Cedar Rapids. It is estimated that 5000 hp can be developed, which will be used to generate electricity to be transmitted to this city for lamps and motors. An auxiliary steam plant will be erected to use for emergency purposes.

DES MOINES, IA.—The Des Moines, Winterset & Creston Electric Railway Company has awarded a contract for the construction of its proposed railway from Des Moines to Creston, Ia., to the Interurban Company, of New York, N. Y. L. H. Hixson, of Des Moines, is general manager.

DES MOINES, IA.—The Des Moines Electric Company, recently incorporated with a capital stock of $5,000,000, has taken control of the Des Moines Edison Light Company. It is said that a bond issue of $730,000 will be made immediately to take up the outstanding indebtedness of the Des Moines Edison company. P. B. Sawyer is general manager.

FAIRFIELD, IOWA.—The Fairfield Gas & Electric Company is contemplating taking over the municipal electric light plant. The company offers to furnish electricity for lighting the streets of the city and for operating the water works pumps at the same rate that it is now costing the city. The municipal plant is inadequate to supply the demands made upon it.

IOWA CITY, IA.—Two propositions have been submitted to the City Council for lighting the streets of the city. The Iowa City Electric Light Company has submitted a proposition offering to reduce the price of lighting by arc lamps from $71 per lamp to $60 per lamp and to install additional arc lamps at the same rate on a 10-year contract. Franklin Benjamin offers to install a plant and furnish electricity for lighting the streets at the rate of $71 per lamp per year on a 25-year contract and at the end of 25 years to give $25,000 in cash or turn over the plant to the city.

SPIRIT LAKE, IA.—The citizens have voted to grant a franchise to the Sioux City-Spirit Lake Interurban Railway to construct and operate an electric railway on the streets of the city, together with an electric light franchise and the use of a 10-acre lot on which to erect a power house and terminals.

McPHERSON, KAN.—The Board of Trustees has called an election to vote on the proposition of issuing $65,000 in bonds for the purchase and extension of the local electric light and water plant.

ST. MARY'S, KAN.—Bids will be received until Nov. 10 for the construction of an electric light plant, to cost about $15,000, and a water works system, to cost about $47,000. Burns & McDonnell, of Kansas City, Mo., are the engineers.

TOPEKA, KAN.—Proposals will be received at the office of the Secretary of State, Topeka, Kan., until Oct. 28 for furnishing and installing two electric generators, with a rating of 30 kw each, wound for 120 volts at no load and 125 volts full load, to conform with the present working unit. The generators to be installed upon foundations already built at the State House heat and power plant, and to be provided with pulleys the same as on old machines. Bidders are to state a price they will allow on old machines and remove them from the premises at once. Charles E. Denton is secretary of the Executive Council.

LEXINGTON, KY.—Work will commence on the construction of the distribution system of the Kentucky Water, Heating & Illuminating Company as soon as the contract with the city is closed.

BELFAST, MAINE.—The Belfast Gas & Electric Company is making improvements at its East Belfast plant, which will include the rebuilding of the dam.

BUCKSPORT, MAINE.—The Penobscot Bay Electric Company is planning to extend its transmission line from East Orland to Stockton and to Belfast, this fall. A. C. Hopkins is superintendent.

BALTIMORE, MD.—The merchants on Lexington Street have started a movement to light Lexington Street, between Charles and Eutaw Streets, with the same style of lamps as used on Baltimore Street. It is said that Mr. McCuen, superintendent of lamps and lighting, is in favor of the proposition. It is also planned to place new lamps on Charles Street from Lexington to Baltimore Street.

CUMBERLAND, MD.—The Keystone Light & Power Company has applied for a franchise to construct an electric railway to Switchback and to Kimball, 16 miles in length.

BOSTON, MASS.—The officials of the Boston & Albany Railroad Company have closed a contract with the Edison Electric Illuminating Company for the installation of 426 hp in motors, about 300 incandescent lamps and 40 arc lamps in its warehouse and receiver at the East Boston Terminal. The motors will be of the alternating-current type.

BOSTON, MASS.—The towns of Medway and Sharon have recently awarded contracts to the Edison Electric Illuminating Company for supplying electricity for lighting the streets of the towns, which will go into effect this fall. The contracts, which are for a term of 10 years, will secure each town a discount of 10 per cent from the regular schedules. The company is replacing the old incandescent street lamps in both towns with new tungsten lamps of 40 cp.

CHESHIRE, MASS.—The Selectmen have granted the Adams Gas Light Company permission to furnish electricity or gas in the town.

EAST BOSTON, MASS.—Eugene N. Foss and associates contemplate the construction of a group of cotton mills in East Boston, on the section lying between Boston and Revere Beach and the Lynn Railroad and Chelsea Creek. A belt railroad around East Boston to be operated by steam or electricity is being promoted in connection with the project.

WOBURN, MASS.—Improvements and alterations in the system for supplying electric service in Woburn, Winchester and Stoneham made by the Edison Electric Illuminating Company is nearly completed and will be placed in operation some time this month. The cost of the work is estimated at $75,000, and will greatly increase and improve the service. Electricity for operating the system will be furnished from the large power plant in South Boston. Changes have been made in the Woburn station to accommodate the new service, but the present steam plant will be kept in service. The company will be prepared to supply electrical energy for motors in large quantities.

GRAND RAPIDS, MICH.—The North Park Improvement Association has adopted a resolution asking the Grand Rapids-Muskegon Power Company to extend its service to North Park.

SAGINAW MICH.—The Detroit, Flint & Saginaw Railway Company is contemplating extending its system from Frankenmuth to Flint.

BUFFALO, MINN.—Bids will be received by H. C. West, recorder, until Oct. 29, for a 50-kw alternator, 19 arc lamps, transformers, etc.; also for erecting distributing system and furnishing material for same. O. Claussen is consulting engineer.

DEER RIVER, MINN.—A franchise has been granted by the Village Council to furnish electricity for lighting the streets and residences of the village for a term of 20 years. The village has the privilege of purchasing the plant after 10 years.

NEW PRAGUE, MINN.—The contract for building an addition to the municipal electric plant has been awarded to Adolph Kropf. It is proposed to install a storage battery.

PARK RAPIDS, MINN.—Plans are being made by the Northwestern Telephone & Exchange Company for extensive improvements to its system which will involve an expenditure of from $10,000 to $12,000.

VIRGINIA, MINN.—The Virginia Light & Water Company is making arrangements to install a steam plant, which will include two 200-hp boilers and a 500-gal. pump. A new power house will be erected to accommodate the new equipment.

NEVADA, MO.—The Nevada Mutual Telephone Company has filed an amendment to its charter changing its name to the Story County Mutual Telephone Company.

GREAT FALLS, MONT.—W. W. Withee and W. S. Cargill are reported to be interested in the construction of an electric railway from Great Falls to Conrad, a distance of 25 miles.

HELENA, MONT.—Improvements are contemplated for the local system of the Rocky Mountain Bell Telephone Company, the cost of which is estimated at $10,000, and will include the construction of an underground conduit system. The company is also rebuilding its telephone line between Helena and Logan.

MILES CITY, MONT.—Plans are being considered for improvements to the municipal street lighting system.

BELGRADE, NEB.—The citizens are considering the question of establishing an electric light plant and water works system.

OMAHA, NEB.—The Omaha & Council Bluffs Street Railway Company contemplates the double tracking of its system to the city limits of Florence in the spring.

RENO, NEV.—Surveys have been made by F. Broili, engineer of the Truckee River General Electric Company, and Walter E. Trent, engineer for the Nevada Machinery & Supply Company, for its proposed transmission line from a point on the transmission line of the Truckee River General Electric Company, near Yerington, to Rawhide, which is expected to be completed within a few months; in the meantime a local plant operated by gasoline engines will be installed.

GLEN RIDGE, N. J.—A committee has been appointed by the Borough Council to investigate the question of securing an electric lighting service for the town.

LONG BRANCH, N. J.—The Atlantic Coast Electric Railway Company has been granted a franchise to construct and operate an electric railway between Pleasure Bay and Monmouth Beach.

ALAMOGORDO, N. M.—W. E. Fletcher and E. Krause, of El Paso, Tex., have acquired water rights along the Penasco River in the Sacramento Mountains and are planning to construct a canal which will divert the water into Cox Canyon, where a large hydro-electric palnt will be installed. Transmission lines will be erected from the plant to Alamogordo, Cloudcroft, Orogrande and other towns in New Mexico and to El Paso.

BERGEN, N. Y.—The Genesee County Electric Light, Power & Gas Company, of Batavia, N. Y., has given up its contract to furnish electricity in Bergen, the streets having been in darkness since Oct. 3. The company has agreed to turn over its pole line and to pay the village $700.

BUFFALO, N. Y.—The Board of Trustees of the city and county hall building is considering the question of lighting the building with electricity. Under the plans prepared by J. J. O'Leary, electrical engineer, it will take about 4000 lamps. The Trustees propose to advertise for bids for the work.

CANANDAIGUA, N. Y.—The Board of Water Commissioners has requested an appropriation of $35,000 for the purpose of installing two motor-driven centrifugal pumps with a rating of 2,500,000 gal. each, for which bids will be called for as soon as the appropriation is granted. Electricity for operating the pumps will be secured from the Ontario Light & Traction Company.

DELMAR, N. Y.—The citizens are considering the question of lighting the streets of the town by electricity.

DUNKIRK, N. Y.—The Dunkirk Power & Heating Company has applied to the City Council for a franchise to furnish electricity for motors in this city. The company now has a limited franchise.

FULTON, N. Y.—Plans are being made by the American Woolen Company for remodeling its entire water plant, which includes the raising the upper dam 6 ft. The company also proposes to remodel the power house and install new water wheels, and also to install two dynamos to generate electrical energy and equip its mills to be operated by electricity.

GARDENVILLE, N. Y.—The Buffalo Southern Railway Company has awarded a contract to the Pinckerton Construction Company, of Philadelphia, Pa., for the construction of a six-mile extension. The company plans later to build another 10-mile extension to East Aurora.

HUNTINGTON, N. Y.—The Huntington Light & Power Company is making arrangements to construct an addition to its power house and to install a 500-kw turbo-generator set and other necessary equipment. An issue of $50,000 in bonds will be made, the proceeds to be used to pay for the proposed improvements.

NEW YORK, N. Y.—The contract for furnishing and installing the electrical equipment for the overhead trolley system of the Blackwell's Island Bridge has been awarded to E. J. Duggan, for $95,845. J. W. Stevenson is commissioner of bridges.

NEW YORK, N. Y.—The contract for the installation of the electric wiring, etc., for the lighting of the Blackwell's Island Bridge over the East River, between the boroughs of Manhattan and Queens, has been awarded to Louis Wechsler for $41,800. J. W. Stevenson is commissioner of bridges.

NEW YORK, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of school buildings, at the office of the Department of Education, Park Avenue and 59th Street, New York City, until Oct. 26, for installing electric equipment, in addition to and alterations, in Public School No. 132, on Wadsworth Avenue, between 152d and 153d Streets, Borough of Manhattan.

NEW YORK, N. Y.—Bids will be received until Oct. 23 by John F. Ahearn, borough president, for repairs and alterations and materials required for alterations, extensions of electric lighting equipment, electric lighting fixtures, etc., in the hall of records. Blank form of bid and contract may be obtained at the office of Horgan & Slattery, architects, 41 West Thirty-third Street, New York, N. Y.

NIAGARA FALLS, N. Y.—The Niagara Pump Board Company has contracted with the Niagara Falls Hydraulic Power & Manufacturing Company for 1000 hp of electrical energy to meet the demands of its increasing business. The Cataract City Milling Company will also purchase electricity to operate the large addition to its plant here, recently completed.

PLATTSBURG BARRACKS. N. Y.—Bids will be received at the office of the constructing quartermaster, Plattsburg Barracks, N. Y., until Nov. 18, for the construction of a transformer station and installation of an electric lighting system at this post; also for furnishing electrical energy for operating the system.

PORT JERVIS, N. Y.—The Interstate Hydro-Electric Company, recently incorporated, is preparing plans for the construction of a hydro-electric power plant at Mongaup Falls, Sullivan County, where it proposes to develop about 1200 hp. The company has applied to the City Council for a franchise to erect transmission lines for the distribution of electricity in this city. E. P. Emerson is president.

RIVERHEAD, N. Y.—The contract for enlarging and improving the hydroelectric plant of the Riverhead Electric Company has been awarded to Muralt & Company, 114 Liberty Street, New York, N. Y. The water wheels now in use will be replaced with new Trump wheels of the vertical shaft type. The electrical equipment will be of the three-phase, alternating type, with a frequency of 60 cycles and 1100 volts. There is also an auxiliary steam plant for emergency purposes.

WEEDSPORT, N. Y.—The plant and franchises of the Weedsport Telephone Company were sold under a mortgage foreclosure Oct. 3 to Wilson E. Palmer, of Ira, for $10,600, who represented a committee of bondholders.

WILLIAMSVILLE, N. Y.—Plans are being prepared by the Williamsville Electric Light & Power Company for the construction of a new power house. Water turbines and generators will be installed.

BEAUFORT, N. C.—The Town Commissioners have decided to authorize an issue of $20,000 to establish an electric light plant and make other improvements. Richard Rice is mayor.

JAMESTOWN, N. D.—The installation of an electric pump in the water works system is recommended by L. F. Crabbe, of Fargo, N. D., consulting engineer.

YOUNGSTOWN, OHIO.—The City Council has awarded a contract to the Western Electric Company for cables for fire and police signal systems, for $4,872.

SAPULA, OKLA.—The Sapula Interurban Railway Company is preparing plans to extend its railway to the Glenn Pool oil field and on to a connection with the Midland Valley Railway in Glenn Pool. E. C. Reynolds is general manager.

PORTLAND, ORE.—The contract for erecting an 80-mile private long-distance telephone line between the Beck Building in Portland to a point 15 miles east of Mt. Hood has been awarded to Edwin G. Amme. The line will be two-wire copper metallic circuit and eight miles over the summit of the mountain will be laid underground. The line will be used by the U. S. Forest Service for communication with the Forest rangers in the Cascade National Forest Reserve.

CLAYSVILLE, PA.—The National Telephone Company, which recently acquired the local telephone plant and holdings, is making extensive improvements to both the local and long-distance service, including the replacing of the present wire system with cables. The cost of the work is estimated at $5,000.

LANDISVILLE, PA.—A small hydro-electric plant is being erected on Chiques Creek to furnish electricity for lamps and motors in Sabunga and Landisville. The hydraulic machinery was installed by B. F. Groff, of Lancaster, Pa., and the electrical equipment was furnished by the Westinghouse Electric & Manufacturing Company, of Pittsburg, Pa.

NUMIDIA, PA.—Plans have been prepared by the Roaring Creek Valley Telephone Company to extend its telephone line to Fisherdale at once. A trunk line will also be erected at Ringtown to connect with lines at that place.

POTTSVILLE, PA.—Plans are being made by the Ringtown Telephone Company to extend its system from Ringtown to Shermansville and Mainville.

TITUSVILLE, PA.—The Titusville Utilities Company is said to have been formed to take over all the public utilities in Titusville, and to make this town the center for interurban railways in all directions. A railway will be built to Cambridge Springs, with a branch to Union City. Another railway will be constructed to Franklin and a through line south to Butler to connect for Pittsburg; an air line railway will be built from Butler to New Castle, a distance of 25 miles. The company is capitalized at $6,000,000.

BLACKSBURG, S. C.—A petition is being circulated by the citizens to call an election for the purpose of voting on the proposition of issuing bonds to install an electric lighting system in the town.

CHESTER, S. C.—Plans are being made to construct underground conduits in the business section of the city by the Chester Telephone Company.

CONWAY, S. C.—A company has been organized for the purpose of establishing an electric light plant in Conway. Senator D. A. Spivey is president of the company and Paul Quattlebaum is general manager.

BELLE FOURCHE, S. D.—Arrangements are being made by the Northwestern Land Company and J. W. Smith to establish a telephone line to Camp Brook.

FLANDREAU, S. D.—The local telephone company is making arrangements to rebuild several of its telephone lines this fall.

PHILIP, S. D.—Plans are being prepared by the Great Western Telephone Company to construct a telephone line along North Fork.

SIOUX FALLS, S. D.—The contract for supplies and equipment for the Electric Light Department has been awarded to George E. Wheeler.

VERMILLION, S. D.—The Northwestern Telephone Company has taken over the independent telephone line from Yankton to Elk Point and from Elk Point to Canton, and has also obtained a 99-year lease on connections with the local independent exchange at Yankton.

HUMBOLDT, TENN.—Plans are being made to install an additional 250-hp engine and generator in the municipal electric light plant.

BAY CITY, TEX.—It is reported that A. L. Strang, of New York, N. Y., has purchased an interest in the plant of the Crystal Ice & Light Company at Bay City, Tex., and proposes to make improvements to the property, including the installation of electric generators and ice machines.

EL PASO, TEX.—A franchise has been granted to Richard Caples and W. B. Latta to construct an interurban railway from El Paso to Fabens, a distance of 32 miles.

FORT WORTH, TEX.—The question of installing additional equipment in the municipal electric light plant to meet the requirements of the increased demands made upon it is under consideration.

SHERMAN, TEX.—Bids will be received at the office of Henry Zimmerman, city secretary, until Nov. 2, for electrical machinery and deep well pumps, as per plans and specifications on file at the office of P. C. Thurmond, city engineer. The citizens recently voted to issue $14,000 in bonds for extensions to the municipal electric light plant and $16,000 for improvements to the water works system.

HUNTSVILLE, UTAH.—Preliminary work has been commenced at South Fork Canyon, above Huntsville, on the construction of a pipe line in connection with a power plant to be operated in Ogden. It is said that the plant will furnish electricity for lamps and motors for the block bounded by Twenty-fourth and Twenty-fifth Streets and Washington and Grant Avenues in Ogden. The work will involve an expenditure of about $150,000 and will be built under the supervision of L. B. Spencer, engineer.

SILVER CITY, UTAH.—Owing to the unsatisfactory electrical service furnished the Tintic Smelting Plant, it has been compelled to close down. The owners of the plant propose to install a power system which will operate a plant with more than double the output of the present mill. Jesse Knight is at the head of the enterprise.

CLAREMONT, VT.—The hydro-electric plant of the Claremont Power Company at Cavendish, Vt., is completed and is now furnishing electricity for operating the street railway and lighting system in Claremont, and will also furnish energy for operating manufacturing plants in this city. The plant will have an output of 2250 hp. L. N. Wheelock is general manager.

ABINGDON, VA.—It is reported that the United Power Company is planning to establish an electric light plant near Abingdon. Low head turbines with a rating of 1000 hp will be installed. Henry J. Palmer is president and engineer; address care of J. Eugene Pool, 102 Silsby Building, Newport News, Va.

DANVILLE, VA.—An appropriation of $22,000 has been made for improvements to the municipal electric light plant, which will include an additional boiler, a 500-kw turbo-generator set, etc., contract for which has been awarded to the Allis-Chalmers Company, of Milwaukee, Wis. Frank Talbott is superintendent of the Water, Gas and Electric Department.

MT. WEATHER, VA.—The contract for furnishing boilers, mains, return pipes, etc., also feeders for electric light and power purposes for the central heating and power station of the Weather Bureau at Mt. Weather, Va., has been awarded to the York Engineering Company, of York, Pa.

NORFOLK, VA.—The City Council is considering the question of establishing a municipal electric light plant.

BOTHELL, WASH.—The County Commissioners have granted the Seattle, Snohomish & Everett Railroad Company a franchise to construct an electric railway on the county road to Bothell, a distance of 12 mlies. C. C. Chittenden, president.

CHEHALIS, WASH.—The local telephone system of the Sunset Company has been purchased by J. Y. Coffman, who contemplates the construction of a new building for the telephone exchange.

HUSUM, WASH.—Martin and J. T. Thompson are installing an electric light plant in connection with their irrigating power plant, and expect to supply the towns of White Salmon and Bingen with electricity for lamps. The power plant will have an output of 3000 hp.

SEATTLE, WASH.—Arrangements are being made to install an electric lighting system in York, a suburb of Seattle. The distributing system is now being erected, and it is expected to have the plant in operation by Nov. 15.

SEATTLE, WASH.—The city has appropriated $430,000 for improvements and additions to the municipal electric plant, and $96,000 for additional street lamps for the following year. It is estimated that with the extensions now planned the earning power of the plant will be increased from $360,000 to $450,000 a year. L. B. Youngs is superintendent of the municipal plant.

SEATTLE, WASH.—The Seattle Electric Company has closed a contract with the Alaska-Yukon-Pacific Exposition Company to furnish all the electrical energy that will be required for lamps and motors for the exposition. The contract covers a period beginning as soon as preparation can be made and continuing until Feb. 1, 1910, and provides for furnishing all material and apparatus and material in connection with the installation and furnishing the energy. The Seattle Electric Company will establish and maintain an electrical department on the grounds and take charge of all electrical work in connection with the fair. A substation will be erected in the grounds and electricity transmitted over a high-tension line at 13,000 volts and stepped down to 2300 volts for general distribution to the various buildings. About 2500 kw will be required for lamps and motors for the use of the exposition, in connection with lighting the buildings and grounds and operating pumps, and an additional 2500 kw will be required for concessionaires, making a total of 5000 kw. Stone & Webster, of Boston, Mass., are general managers.

SPOKANE, WASH.—The Spokane & Inland Empire Railway Company will extend its system from Hayden Lake, Idaho, to Idlewild, on Lake Pend D'Oreille, a distance of 22 miles.

SPOKANE, WASH.—Surveys are being made for the proposed electric railway to be built by the Big Bend Transit Company from Spokane to Davenport, with a branch to the junction of the Spokane and Columbia Rivers. The company proposes to construct a power station at the Narrows, located one and one-half miles above the mouth of the Spokane River.

SUMAS, WASH.—The Nooksack Valley Traction Company has applied to the Town Council for a franchise to construct a railway on certain streets of the town from the south limits to the International boundary line to connect with the system of the British Columbia Electric Railway Company.

VANCOUVER, WASH.—The Portland Railway, Light & Power Company has been granted a franchise to install an electric light plant just outside the city limits.

WALLA WALLA, WASH.—The Walla Walla Traction Company intends to make extensions and improvements in its present power system. The company has acquired 24,000 miners' inches of water in the Walla Walla River, and the right to build storage dams 150 ft. high across the river. The filings were made at Pendleton by George D. O'Conner and John E. Tate, of the company.

BELOIT, WIS.—A new 500-kw turbo-generator set has recently been installed in the plant of the Beloit Water, Gas & Electric Company, which will increase the output of the plant by 50 per cent.

LA CROSSE, WIS.—Application has been made by Alderman C. F. Lang to the State Railroad Commission for permission to establish a municipal electric light plant in La Crosse.

MILWAUKEE, WIS.—The Wisconsin Telephone Company is preparing plans for improvements to the lake shore section of its system, which will involve an expenditure of $100,000. H. O. Seymour is general manager.

MILWAUKEE, WIS.—The City Council has adopted a resolution to erect a municipal electric light plant on the property purchased on Kinnickinnic River, between Madison and Washington Streets. It is proposed to install one unit of sufficient output to supply electricity for 1000 arc lamps.

CODY, WYO.—It is stated that the Government may install an electric light and power plant at its Shoshone dam to furnish electricity for lamps and motors to the surrounding towns. The power house will be located at Corbett and water to operate the plant will be taken from the Corbett Tunnel, which has a drop of over 50 ft. For further information address the Secretary of the Interior, Washington, D. C.

ST. BONIFACE, MAN., CAN.—By-laws are being prepared to raise sufficient money to construct a municipal electric lighting and gas plant. For further information, address Theodore Bertrand.

FORT FRANCIS, ONT., CAN.—Work has again started on construction of the dam here. J. J. Wood & Company, of New York, N. Y., have the contract for the completion of the dam and the erection of the power plant.

PORT ARTHUR, ONT., CAN.—Applications will be received by E. S. Rutledge until Oct. 30 for the position of manager for the electric street railway system, operating here and in the town of Fort William.

TORONTO, ONT., CAN.—The city engineer will soon submit a report advising plans and specifications for the installation of an electrical pumping plant.

TORONTO, ONT., CAN.—The Board of Control has appointed Alexander Dow, of Detroit, Mich., consulting engineer in connection with the construction of the electrical distributing plant.

GUADALAJARA, MEX.—The Compania de Tranvias, Luz y Fuerza of Guadalajara, which owns the electric street railway, light and power systems of this city, has made surveys for a proposed electric railway between Guadalajara and the town of Chapala, about 35 miles in length. The route of the new line will be by way of Juanacatlan, where one of the large hydro-electric plants of the company and a number of manufacturing concerns are located. The company has a capital stock of $14,000,000. Tomas Torres is general manager of the company.

MEXICO CITY, MEX.—La Compania Minera las Dos Estrellas, which owns large mines in El Oro District, is preparing to extend its electrical system to the railway which it now operates between its mines and reduction mill. Electricity for operating the system is supplied by the Mexican Light & Power Company.

MEXICO CITY, MEX.—The Aztec Queen Mining Company is preparing to install a hydro-electric plant on the Miravalles River, in the

territory of Tepic, for the purpose of generating electricity for operating the machinery of its Huicicila Mines and to operate an electric railway system which it proposes to build to connect its mines with the port of Platanitos. The proposed road will be about 16 miles long. It is estimated that about 4000 hp can be developed at the site of the proposed hydro-electric plant. The company has a capital stock of $3,000,000. W. E. Clark is general manager.

New Industrial Companies.

THE A. Z. SMITH ELECTRIC COMPANY, of Tacoma, Wash., has been incorporated, with a capital stock of $50,000, by A. Z. Smith and Joseph Hertogs.

THE AMERICAN ELECTRIC FURNACE COMPANY, of Niagara Falls, Ont., Can., has been incorporated, with a capital stock of $50,000, and the following directors: T. Rowlands, W. H. McGuire and F. W. Griffiths.

THE AURORA ARC LAMP COMPANY, of New York, N. Y., has been chartered, with a capital stock of $1,000, and the following directors: Arthur Rosenberg, Max L. Schallek and Sigmund Feinblatt, all of New York, N. Y.

THE PORTER ENGINE & MACHINE COMPANY, of Dover, Del., has been incorporated, with a capital stock of $50,000, by Willard J. Spencer and John D. Porter, of New Haven, Conn., and W. I. N. Lofland, of Dover, Del.

THE GEORGE M. PAINTER ENGINEERING & CONTRACTING COMPANY, of New York, N. Y., has been chartered, with a capital stock of $100,000. The directors are J. Disbrow Baker, Arthur W. Britton and Benjamin F. Russell, all of New York, N. Y.

UNIFORM SEAMLESS WIRE COMPANY, of Saco, Maine, has been incorporated, with a capital stock of $200,000, for the purpose of manufacturing and selling tubes made of metals. The officers are: F. E. Whitman, president, and J. G. Smith, treasurer, both of Saco, Maine.

THE PHONE-HEAR-PLAIN COMPANY, of New York, N. Y., has filed articles of incorporation, with a capital stock of $100,000, for the purpose of manufacturing specialties and telephone improvements. The incorporators are Berthold Levi, Henry Papheal, Donn Wood, Isaac Rheinstrom and Peter Zucker, all of New York, N. Y.

New Incorporations.

SAN FRANCISCO, CAL.—The Aerial Telephone & Power Company, with a capital stock of $200,000, has been incorporated by L. M. Sherwood, F. J. Golden, C. H. Holzborn, W. L. Horshbarger, W. R. Anderson, A. Kovarik and J. T. Geraty.

NAUVOO, ILL.—The Nauvoo Electric Light & Power Company has been chartered, with a capital stock of $5,000, by John A. Bortz, James H. Farren and John Schmitz.

WAUKEGAN, ILL.—The Lake County Electric Light & Power Company has been incorporated, with a capital stock of $6,000, by Harry Hoyt, Lee Minnis and George Charington.

AROMA, IND.—The Farmers' Telephone Company has been organized, with a capital stock of $15,000. The company is in the market for material and equipment for the installation of an exchange and telephone system in this place.

INDIANAPOLIS, IND.—The Portage Prairie Telephone Company has been incorporated with a capital stock of $5,000 to operate a telephone system in German and Warren Townships.

SOUTH BEND, IND.—The Portage Prairie Telephone Company has filed articles of incorporation with the Secretary of State, with a capital stock of $15,000. The company proposes to build and operate a telephone system in German and Warren townships. J. M. Swartz, Louis B. Rough and Elmer J. Whitmer are the directors.

ESSEX, IA.—The Farmers' Telephone Company has been chartered, with a capital stock of $15,000, by G. A. Lagequist, Andrew Frederickson, George Maxwell, G. W. Peterson and Anton Peterson.

POOLESVILLE, MD.—The Montgomery Telephone Company has been formed to build and operate an independent telephone system in Montgomery, Howard, Frederick and Carroll Counties. Howard G. Spurrier, of Poolesville, is president; A. D. Trundle, vice-president, and Reginald J. Darby, secretary and treasurer.

GLADWIN, MICH.—Articles of incorporation have been filed for the Gladwin & Nolan Telephone Company, with a capital stock of $1,200.

ONAMIA, MINN.—The Mille Laos Telephone Company has been organized for the purpose of building a telephone line to Milaca. G. H. Carr is secretary.

ZUMBROTA, MINN.—Articles of incorporation have been filed for the Zumbrota Rural Telephone Company by Frank G. Marvin, F. C. Marvin and John Grimm. The company is capitalized at $30,000.

FLAT RIVER, MO.—Articles of incorporation have been filed for the Lead Belt Telephone Company, with a capital stock of $20,000, by J. A. Thompson, T. Isbell, J. G. Layne and others.

BILLINGS, MONT.—Articles of incorporation have been filed for the Billings Mutual Telephone Company, with a capital stock of $500,000, by P. B. Moss, G. M. Hays, J. Nevin Perry and S. S. Moore.

CLOSTER, NEB.—The Sheel Creek Mutual Telephone Company has been incorporated with a capital stock of $20,000.

LINCOLN, NEB.—Articles of incorporation have been filed for the Omaha, Lincoln & Southeastern Railroad Company to build a railway between Omaha and Lincoln. The capital stock is placed at $100,000, and the incorporators are: Ellery S. McNaul, L. Howard Brumbaugh, I. G. Ladd, F. H. Rile, G. E. Moffat, Stephen St. John Malvern, all of New York, N. Y.; Nicholas D. Pound, of Chicago, Ill.; De Ver Sholes and Charles L. Dundey, of Omaha.

WAHOO, NEB.—The Golden Rod Telephone & Telegraph Company has been incorporated with a capital stock of $100,000.

HAMILTON, N. Y.—The Middletown Telephone Company has been organized and the following officers elected: W. S. Harlan, president, and L. T. Palmer, secretary and treasurer.

SUMMIT, N. Y.—Articles of incorporation have been filed for the Summit Telephone Company, with a capital stock of $2,500, and the following directors: George Skidmore, Eli Baker, Alvin Joslyn, Charles F. Wharton, Miles W. Crapser, Frank Fox, of Summit, and Myron Grey, of Fulton.

WEEDSPORT, N. Y.—The Cayuga-Onondaga Telephone Company has filed articles of incorporation, with a capital stock of $9,900. The directors are William E. Palmer, B. F. Selmser and Fred M. Harrington, of Weedsport, N. Y. The company recently acquired the plant and holdings of the Weedsport, Jordan & Elbridge Telephone Company.

CAMDEN, OHIO.—Articles of incorporation have been filed for the Camden Electric Light & Milling Company by Charles S. Houston and others. The capital stock of the company is placed at $25,000.

CLOUD CHIEF, OKLA.—The Cloud Chief Telephone Company has been incorporated with a capital stock of $10,000 by J. B. Baldwin, H. Gerbert and G. W. Maddox, all of Cloud Chief.

BEAVER CREEK, ORE.—The Beaver Creek Mutual Telephone Association has been formed, with a capital stock of $5,000, by Fred Kamrath and others.

BEAR GAP, PA.—The Bear Gap & Numidia Telephone Company has been in corporated with a capital stock of $5,000. Adam W. Dimmick is treasurer.

HARRISBURG, PA.—The Parker Telephone Company, of Parker City, has been incorporated, with a capital stock of $5,000, to operate a telephone system in Armstrong, Clarion, Butler and Venango Counties in this State.

HARRISBURG, PA.—The Fairmount Electric & Manufacturing Company has been incorporated with a capital stock of $50,000. The directors are: Chester S. Leonard, of Philadelphia, Pa.; Edward T. Slack, of Wycombe, Pa., and Edward D. Saint, of Woodbury, N. J.

LAVELLE, PA.—The Lavelle Telephone & Telegraph Company has been incorporated with a capital stock of $5,000. H. C. Lenker, of Lavelle, is treasurer.

CAMERON, S. C.—The Cameron Telephone Company has been organized to erect a telephone system in Cameron. Equipment for the system has been ordered from the Western Electric Company. James M. Moss is president and Harvey L. Taylor, secretary and treasurer.

BOERNE, TEX.—The San Antonio Northwestern Telephone Company has been incorporated, with a capital stock of $15,000, by M. B. Huling. I. W. Ross and F. W. Johnson.

NORTH YAKIMA, WASH.—The Yakima Valley Power Company has been incorporated, with a capital stock of $300,000. Robert E. Strahorn, president of the North Coast Railway and the Northwest Light & Water Company, is the chief promoter. The plants at Pasco, Kennewick and Prosser are to be combined, and it is expected that the company will furnish electricity for operating the Cascade division of the North Coast Railroad, which will probably be operated by electricity.

BASIN, WYO.—The Greybull Telephone Company has filed articles of incorporation, with a capital stock of $5,000. The directors are: Jonathan Frisby, Albert Wilson and Sophia Wilson.

CRANBROOK, B. C., CAN.—The Kootenay Telephones, Ltd., has been formed in Cranbrook. It will be capitalized at $200,000. It has purchased the system of the Cranbrook Telephone Company and proposes to operate within the boundaries of British Columbia.

YELLOW GRASS, SASK., CAN.—The Yellow Grass Electric Light & Power Company has been organized.

Legal.

RECEIVER FOR POWER COMPANY.—Judge Hazel, of the United States District Court at Buffalo, N. Y., Oct. 15 appointed Marc W. Comstock, of Buffalo, N. Y., as receiver for the Genesee County Electric Light, Power & Gas Company, of Batavia. The company has been in business but a few months, and distributes electrical energy generated at the plant of the Niagara Lockport & Ontario Power Company, of Buffalo, N. Y., in Batavia, Oakfield, Akron and Clarence.

DUTY TO PROVIDE ELECTRICAL APPARATUS FREE FROM DEFECTS.—An action was brought by one who had been given temporary employment as a substitute in the boiler room of the defendant's

plant, to recover for injuries which he received upon coming in contact with the metal part of an incandescent lamp. In performing his duties about the machinery in his charge the plaintiff was required to use an electric light at each of two places in the room. At each of these places was a socket connected with the incadescent lighting system of the building, but only one bulb was provided, and it was necessary for plaintiff to detach this bulb from time to time as he required light at these different places. The brass portion of the bulb was not insulated, and the insulation was also worn off from the wires, so that when plaintiff took hold of the bulb to detach it from one socket to remove it to another he received an electric shock and his flesh was so burned that he was permanently injured. It was also shown that there was a lack of insulation on the brass part of the bulb and the wires and that the whole wiring of the room in which the plaintiff was employed was defective and out of repair. It further appeared from the evidence that defendant's superintendent had knowledge that the electric lighting appliances in the room where plaintiff was employed were defective, and that persons frequently received shocks while transferring the electric light bulb from one socket to the other. It was held that it was the duty of defendant, upon introducing a dangerous agency into his building, to take every precaution practicable against injury resulting therefrom to his employees, and to warn them of the danger incident to the work. Having failed in these duties, the defendant was held liable in damages. Aga v. Harbach, Supreme Court of Iowa, 117 N. W. 669.

Obituary.

MR. JOHN E. STRICKLAND, of Carthage, Mo., died suddenly Oct. 6. He was president of the Carthage Electric Light & Power Company.

DR. F. A. C. PERRINE.—It is with extreme regret that as we go to press we receive the news of the death of Dr. F. A. C. Perrine, at Plainfield, N. J., after an illness which developed while he was attending the convention of the American Institute of Electrical Engineers last June at Atlantic City, N. J. He was only 46 years of age. An obituary notice will appear next week in these columns.

MR. B. H. BROUGH.—The engineering profession has sustained a severe loss in the death of Bennett Hooper Brough, the secretary of the Iron & Steel Institute of England, who died literally in harness, succumbing to an acute gastric attack just as the reecnt autumn conference of the institute closed at Middleborough. A mining engineer by training and education in England and Germany, an educator and lecturer, he found ideal work when he became secretary of the institute in 1893, and up to the moment of his death his duties were performed with increasing success. His last visit to this country, where he had a host of friends, was in connection with the New York meeting of 1904. Member of a talented and famous histrionic family, he was himself a most accomplished scholar, but best of all he was a kindly, pure-hearted, noble man, whom to know was a privilege. He was only forty-eight years old.

Personals.

GEN. C. E. MURRAY, treasurer of the Crescent Insulated Wire & Cable Company, has been out with the company's agents in Chicago, the Metropolitan Electrical Supply Company.

MR. GEORGE F. BUCHOLTZ, formerly superintendent of the Batavia Light & Power Company, has been appointed superintendent of the Canandaigua Heat, Light, Power & Gas Company, of Canandaigua, N. Y.

MR. A. C. HOPKINS, for the past 17 years superintendent of the Brunswick Electric Light & Power Company, of Brunswick, Maine, has assumed the position of superintendent of the Penobscot Bay Electric Company, of Bucksport, Maine.

MR. A. F. HALL, formerly manager of the Southbridge Gas & Electric Company, of Southbridge, Mass., has accepted the position of general superintendent of the Charlestown Gas & Electric Company, of Charlestown, Mass. Mr. Hall was manager of the Southbridge Gas & Electric Company for 12 years.

MR. S. J. CHAPMAN, superintendent of the Pontiac Electric Light Company, of Pontiac, Ill., has been appointed superintendent of the Clinton Gas & Electric Company, of Clinton, Ill., succeeding Mr. Ira E. Price, who has been appointed manager of the Newport Electric Light Company, of Newport, Ark.

PROF. S. W. STRATTON.—Cable advices from Cambridge University, England, state that on Oct. 17 the honorary degree of doctor of science was conferred upon Professor Samuel W. Stratton, director of the National Bureau of Standards at Washington, on the occasion of his visit to the university. Professor Stratton is a delegate to the International Conference on Electrical Units in London.

MR. H. P. JAMES, formerly electrical engineer of the Bryant Electric Company, now occupies the position of sales manager for the new line of push-button specialties recently placed on the market by the Cutler-Hammer Manufacturing Company, of Milwaukee. Mr. James is a graduate of the Massachusetts Institute of Technology, where he received degrees in both electrical and mechanical engineering. Previous to his connection with the Bryant Electric Company, he was electrical inspector and engineer for the Associated Factory Mutual Fire Insurance Companies. He has thus enjoyed special training for his new work.

HAMNER & MOODY.—Charles Sutherland Hamner and Virginius Daniel Moody have opened an engineering office at 25 Broad Street, New York City, under the firm name of Hamner & Moody. Mr. Hamner is a graduate of Cornell University, degree of M. E., class of '89. After graduation he was connected with the Pennsylvania Railroad at the Altoona shops for several years. He has also been associated with The John A. Roebling's Sons' Company, the Thomson-Houston Company and the General Electric Company. He has had a broad experience in steam plants and traction matters, as well as mining, and installed lately the plant for the Compania de Gas y Electricidad, Havana, Cuba, which comprised steam turbine units. Mr. Moody is also a Cornell graduate, class of '00, with the degree of M. E. and E. E. He was connecetd for several years with the General Electric Company, handling their foreign railway work on such installations as the Paris-Orleans Railroad, the Northeastern Railroad, etc. Mr. Moody was connected for several years with Dr. F. S. Pearson as electrical engineer, in which position he was engaged on long-distance transmission problems, and was resident electrical engineer on the Winnipeg hydro-electric installation, a 60,000-volt plant at Winnipeg, Canada. For the last 18 months Mr. Moody has been associated with Mr. L. B. Stillwell on the East River tunnel work, connecting New York and Brooklyn.

Trade Publications.

ELECTRICAL INSULATING MATERIALS.—With this title the Mica Insulator Company has issued a 64-page pamphlet describing and listing, with code words and prices, its comprehensive line of insulating material. This includes mica, micanite, insulating tapes, cloths, papers, tubing, varnishes and compounds.

THE CENTRAL ELECTRIC COMPANY, Chicago, Ill., is distributing circulars descriptive of its flexible steel conduit and conductors. It is claimed that this conduit is absolutely flexible and can be installed at much less expense than a rigid pipe system. The circular also contains illustrations of the Armour stripping tools and their application. Copies will be mailed to those interested.

MULTIPLE LUMINOUS ARC LAMPS.—Bulletin No. 4621 of the General Electric Company, Schenectady, N. Y., illustrates and describes its luminous arc lamp for multiple circuits. A lamp intended primarily for use in foundries, machine shops, freight houses, etc., where a large unit is desired, is fully described. The lamp is made for 110 and 220 volt direct-current circuits. Moreover, a multiple luminous lamp for use on direct-current motor circuits, and also for use as a head lamp on interurban cars and mining locomotives, is illustrated and full described.

DIRECT-CONNECTED UNITS.—Allis-Chalmers Company has the distinction of building the first Corliss engine for direct connection to an electric generator. This unit was put in service nearly 15 years ago, and more than one thousand Reynolds-Corliss engines are now in successful operation all over the world. Many of the first engines have been running continuously ever since. Among the largest engines ever built for direct connection are the combined horizontal and vertical compound heavy duty machines constructed by Allis-Chalmers Company for the Manhattan and subway stations of the New York City Railway. Some of the different styles of direct-connected heavy duty engines are shown in Allis-Chalmers Bulletin No. 1510.

THE ELECTRIC STORAGE BATTERY COMPANY, of Philadelphia, has just issued the second section of a new series of sectional price-lists. It covers the elements, jars and tanks of the "Chloride" accumulator for electric railway, general lighting and power, isolated lighting, interlocking switch and signal, telephone, telegraph, fire alarm, laboratory, small motor work and miscellaneous service. This price-list will be known as Section A and will be followed by other sections covering the many applications of the "Chloride," "Exide" and "Tudor" accumulators. Copies will be forwarded upon application to any of the sales offices of the company. Section C, covering the "Chloride" and "Tudor" accumulators for car lighting service, was issued in June.

THE CENTRAL ELECTRIC COMPANY, Chicago, Ill., is sending out a small circular announcing a 10 per cent. reduction in Columbia tungsten lamps. This reduction took effect Sept. 1, 1908. The circular calls attention to the fact that transportation on standard packages of these lamps will be allowed east of the Mississippi River, and a small additional charge will be made for delivery to other points. An interesting item of information contained in the circular is a statement that the company's record for breakage for six months amounts to approximately 2 per cent. upon the actual value of the lamps shipped. The Central Electric Company are carrying a complete stock of all sizes and styles of Columbia tungsten lamps in stock, and desire to make quotations.

AUTOMOBILE INSTRUMENTS.—Bulletin No. 4612, recently issued by the General Electric Company, Schenectady, N. Y., will be of interest to owners of electric automobiles. It illustrates and describes an automobile instrument consisting of a combination ammeter and voltmeter enclosed in a dust-proof and moisture-proof aluminum case, and is designed to withstand the constant vibration and exposure incident to service on electric vehicles. The two scales of this instrument are so arranged that they may be read simultaneously, and a suitable bracket carrying a miniature lamp with shade, for illuminating the dials, can be furnished if desired. This instrument may be provided at small additional cost with an "anti-vibration" support which adapts it perfectly for use on commercial vehicles. Detailed information is contained in the bulletin.

RAILWAY SUPPLIES.—Vol. VI, No. 5 of the "Keystone Traveler," issued by the Electric Service Supplies Company, 1020 Filbert Street, Philadelphia, Pa., contains many appropriate remarks concerning the Atlantic City convention of the American Street & Interurban Railway Association. Incidentally attention is directed to lamp guards, car cleaners, car bodies, suspension insulators, insulated cables, gears and pinions.

Business Notes.

THE JANDUS ELECTRIC COMPANY, Cleveland, Ohio, has recently secured an order from the Brooklyn Navy Yard for 430 "Art" lamps of the multiple-alternating and series-alternating types.

THE MASSACHUSETTS CHEMICAL COMPANY, Walpole, Mass., reports an exceedingly good demand for its product for export. During three days last week it shipped abroad 20,000 lb. of its "264" tape. The domestic demand is also increasing.

CABLES AND LINE WIRE.—The Bishop Gutta-Percha Company, New York City, has issued a complete set of price-lists and discount sheets covering its line of rubber-covered wires and cables, lead-encased cables, elevator control, lighting and annunciator cables.

CHATTANOOGA ARMATURE WORKS.—Messrs. Frank Steffner and S. V. Steffner are the incorporators of the Chattanooga Armature Works, of Chattanooga, Tenn., of which the former is president and the latter vice-president. The officers have had 18 years' experience in their line of business. The works are fitted for everything in the way of rewinding and repairing electrical machinery.

THE STANDARD GAUGE MANUFACTURING COMPANY will remove its plant and main office from Waterbury, Conn., to Foxboro, Mass., on Nov. 1. By this change the manufacturing capacity will be very largely increased, the two main buildings at Foxboro alone having available 100,000 sq. ft. of floor space. The sales office will be, as heretofore, in the Hudson Terminal, New York, and in the Monadnock Block, Chicago.

THE STOLZ ELECTROPHONE.—The Stolz Electrophone Company will remove its factory about Nov. 15 to 280 East Ohio Street, Chicago, where it will occupy four floors. The present sales office at 92 State Street will be retained. A recent report from the London office of this company states that Lady Truscott, wife of the Lord Mayor of London, has expressed her great appreciation of the Stolz Electrophone, which she said had enabled her to hear a sermon very clearly, which previously she had not been able to do in years.

THE STUART-HOWLAND COMPANY, Boston, has leased the adjoining building, 1, 2 and 3 Winthrop Square and 12 to 36 Otis Street, and recently moved its store and office to that address. This gives a greatly increased space, there being about 13,000 sq. ft. on each floor, and with over 325 ft. of street frontage, the quarters are unusually light and admirably suited for their purpose. Each department has been elaborately fitted with facilities for storing and handling stock, which facilities are now unsurpassed by any electrical supply house in the country.

THE STAVE ELECTRICAL COMPANY has found it necessary to remove into very much larger premises in order to handle efficiently its increasing flaming arc lamp business. The success of the "Stave" flaming arc lamps made the need pressing for centralization of works, stores and office before the lighting season was further advanced. The attractive showroom the Stave Electrical Company has now, where the high candlepower and low current consumption of the lamps will be demonstrated, should be well worth a visit from anybody interested in the lighting proposition. There is also exhibited the "Stavelco" semi-enclosed arc lamp, a lamp of very high efficiency and perfectly color true light. This lamp should particularly appeal to dry goods stores, tailors, etc., or any store where the light is required to be as near as possible the same as daylight.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED OCT. 13, 1908.

[Conducted by Rosenbaum & Stockbridge, Pat. Attys., 41 Park Row, N. Y.]

900,693. CIRCUIT-BREAKER; Charles C. Badeau. Schenectady, N. Y. App. filed Sept. 16, 1901. Provides a toggle joint action for bringing the laminated switch brush in contact with the copper blocks of anvils without the use of an excessive force on the operating lever.

900,699. CIRCUIT CONTROLLER; Alexander Bevan, Providence, R. I. App. filed Sept. 16, 1907. A circuit controller of the type for operating electric street railway signals. Designed to be used to control a single circuit or to control two separate circuits. Has separate circuit controlling levers on each side actuated by a single handle movable to three positions.

900,708. HIGH-TENSION CIRCUIT-BREAKER; Fred B. Corey, Schenectady, N. Y. App. filed Feb. 19, 1903. An electric circuit-breaker designed to break high-tension circuits and at the same time be of low cost to manufacture, and not occupying appreciably greater space than the ordinary low-tension switches, or switches having no provisions for disrupting the electric arc.

900,709. ARC-LAMP; James A. Dalzell and Charles E. Hartman, Lynn, Mass. App. filed Feb. 11, 1904. An electric arc lamp having an arc-inclosing bulb communicating with the air through an elongated passage, and means for adjusting the effective length of said passage.

900,717. CABLE FASTENER OR CLAMP; Edward B. Feaster. Kansas City, Mo. App. filed Sept. 26, 1907. Has a conical split bushing in which the cable terminal is received and which is compressed by an ordinary nut threaded thereon.

900,730. BRUSH HOLDER; Harry E. Heath, Lynn, Mass. App. filed April 7, 1904. The brush is guided toward the commutator by a parallel link motion, and is impelled by a spring arm having a roller bearing thereagainst.

900,732. ELECTRICALLY-HEATED CURLING IRON; Harry Hertzberg and Maurice J. Wohl, New York, N. Y. App. filed April 18, 1907. A specially constructed resistance element for a curling iron. Includes a resistance pencil having metal capped ends and enclosed in a metallic tube.

900,733. ELECTRIC LIGHTING; Peter Cooper Hewitt, New York, N. Y. App. filed April 5, 1900. Has a plurality of vapor electrical devices, each acquiring a starting current of higher potential than that upon which it is to be operated, and a reactance device, and means for impressing upon the vapor devices successively high potential currents derived from the reactance device.

900,736. QUICK-BREAK ELECTRIC SWITCH; Harry H. Howard, Plainfield, N. J. App. filed Oct. 24, 1902. A quick-break oil switch adapted to cause the rupture of electric circuits by a quick movement. Specially designed to rupture the starting circuits of gas and vapor lamps of the Cooper Hewitt type.

900,743. RELAY; Isidor Kitsee, Philadelphia, Pa. App. filed Oct. 19, 1907. A cable relay comprising the relay proper, a localized electric circuit adapted to move the movable parts in one direction and mechanical means to move the movable parts in an opposite direction, said localized electric circuit shunting the relay proper.

900,745. SYSTEM OF ELECTRICAL DISTRIBUTION; Osias O. Kruh, Schenectady, N. Y. App. filed Sept. 15, 1905. System of electrical distribution embodying vapor electric apparatus such as rectifiers or the like. Has a number of rectifiers operated in series with each other, so as to divide between them the stress imposed by the impressed alternating electromotive force.

900,752. CONTROLLING MEANS FOR AIR BRAKES; George Macloskie, Schenectady, N. Y. App. filed March 5, 1908. An arrangement whereby both valve and contacts may be operated from a single handle without producing any unnecessary wear on the valve. The connections between the handle or operating member and the valve are so arranged as to permit movement of said handle or member to operate the switch contacts without movement of the valve.

900,771. ARMATURE FOR UNIPOLAR MACHINES; Jakob E. Noeggerath, Schenectady, N. Y. App. filed April 25, 1907. An arrangement of the armature conductors such that the two sets of collector-rings at the opposite ends of the armature may be separated without disconnecting the armature conductors from the collector rings.

900,773. ELECTRIC PLUG RECEPTACLE; George Lewis Patterson, New York, N. Y. App. filed Oct. 8, 1907. A plug and socket connection in which the socket is located in the floor of a theatrical stage or other place, and the plug is inserted therein to make a temporary connection with the electrical system for supplying current to portable lighting and other translating apparatus.

900,780. DYNAMO-ELECTRIC MACHINE; Henry G. Reist, Schenectady, N. Y. App. filed June 20, 1904. A means for supporting the coil of a rotating field magnet against displacement by centrifugal force. Has braces for opposite sides of the winding which are integrally connected together.

900,781. DYNAMO-ELECTRIC MACHINE; Henry G. Reist, Schenectady, N. Y. App. filed March 1, 1905. A collector ring for induction motors where it is desirable at certain stages in the operation of the machine, to have the collector rings and co-operating brushes connected in separate circuits, and at other stages in the operation of the machine to have the collector rings short-circuited together.

900,786. TWO-BUTTON SWITCH; Frank W. Sanford, Schenectady, N. Y. App. filed Oct. 2, 1905. A two-button snap switch having a tilting lever and a frame plate with a trunnion on which said lever is fulcrumed, and a lip bent up from said plate and overlying said lever to prevent its disengagement from said trunnion.

900,793. ARC-LAMP; George E. Stevens, Lynn, Mass. App. filed Sept. 27, 1906. An arc-lamp frame composed of a backbone made of a rod bent into the form of a yoke having depending legs, a sheet metal hood having holes through which said legs pass, and one or more platforms carried upon said legs.

900,830. APPARATUS FOR NEUTRALIZING STATIC ELECTRICITY; William H. Chapman, Portland, Me. App. filed Jan. 23, 1908. Has a hollow conductor connected to earth and having one or more openings through its walls and an electrically charged insulated conductor with small radiating surfaces secured within said hollow conductor.

900,839. ROTOR CONSTRUCTION; Bernard Elshoff. Norwood, Ohio. App. filed Sept. 7, 1906. A rotor member for high-speed generators, designed to withstand the centrifugal forces. Has a core carrying groups of concentric field coils, strap conductors for connecting the coils of each group in series, and a pair of adjacent insulating blocks separating the end-turns of each pair of adjacent coils.

900,854. MEANS FOR LOCKING ELECTRIC SOCKETS TO FIXTURES; Harvey Hubbell, Bridgeport, Conn. App. filed March 16, 1907. A socket shell having a coupling device permanently secured thereto and comprising a two-wing bushing internally threaded to receive a threaded end of a fixture, and means for forcing them concentrically together whereby they bind upon the fixture.

900,884. AUTOMATICALLY ADJUSTABLE BRUSH HOLDER; Walter J. Richards, Milwaukee, Wis. App. filed Sept. 10, 1900. The brush holder has lugs or stops and a frame intermediate to whose length the holder is pivoted, the frame extending between such lugs to limit the relative movements of the holder and frame.

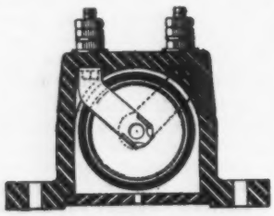
900,909. ELECTRIC GLOW-LAMP, ETC.; Fritz Blau and Hermann Remane, Berlin Germany. App. filed April 25, 1906. The process of making an electric glow lamp having a metallic incandescent body, which consists in providing within the bulb of said lamp a deposit of a metal, and then exhausting the bulb.

900,917. INSULATOR; Grant Dobson, Pittsburg, Pa. App. filed April 1, 1908. An insulator consisting of a supporting stem provided with an insulating block having a groove, and a ring of insulating material surrounding the stem and arranged to engage the wire when inserted in said block.

900,926. ELECTROLYTIC APPARATUS FOR PURIFYING LIQUIDS; John T. Harris, New York, N. Y. App. filed Nov. 20, 1906. A means for treating water to remove impurities, such as organic matter and mineral salts. Has a magnetized iron anode, a cathode, and means for separting the coagulated impurities from the treated liquid.

900,958. SAFETY APPLIANCE FOR ELECTRIC RAILWAYS; Robert K. Richardson, Brooklyn, N. Y. App. filed Sept. 21, 1907. A means for protecting the third rail, and including a plurality of grooved blades which are hinged to close over the rail and are operated by the passage of the collector shoe.

900,961. PRODUCTION OF MAGNESIUM BY ELECTROLYSIS; George O. Seward and Franz von Kugelgen, Holcombs Rock, Va.



901,207.—Lightning Arrester.

App. filed Oct. 10, 1905. The process of producing magnesium, which consists in electrolyzing a fused mixture of magnesium fluorid and a chlorid of an earth-alkali metal more electro-positive than magnesium.

900,962. PRODUCTION OF BARIUM AND BARIUM ALLOYS; George O. Seward and Franv von Kukelgen, Holcombs Rock, Va. App. filed March 28, 1906. The process which consists in electrolyzing fused barium chlorid with the addition of a barium salt of lower melting point.

901,012. ELECTRIC BATTERY; Isidor Kitsee, Philadelphia, Pa. App. filed Oct. 15, 1906. The method of depolarizing an electrode provided with a catalytic substance, which consists in impinging a jet of fluid thereon when out of contact with the electrolyte, whereby oxygen is imparted to said electrode.

901,013. GALVANOMETER; Louis E. Knott. Boston, Mass. App. filed Nov. 24, 1906. Has a suspended coil, a magnet and a spiral electrically connected to the lower end of said coil, and a protecting case surrounding the spiral.

901,027. SAFETY-GUARD FOR TROLLEY WHEELS; Frank J. Nolan, Buffalo, N. Y. App. filed Sept. 13, 1907. A pair of depending inclined plates are positioned alongside the trolley conductor so as to guide the wheel thereon in passing hangers.

901,034. STAGE-POCKET; George Lewis Patterson, New York, N. Y. App. filed Oct. 17, 1907. Relates to a plug opening having a hinged cover with adjustable bearings.

901,108. MUFFLER FOR TELEPHONE TRANSMITTERS; George Kracker, Philadelphia, Pa. App. filed Dec. 28, 1907. In a muffler for telephone transmitters, a casing having openings therein a V-shaped mouthpiece of greater diameter than said openings secured to said casing in alignment with said openings, a sound-deadening material in said mouthpiece and casing, an auxiliary chamber in said casing, an inlet and an outlet for said auxiliary chamber, a longitudinally disposed spiral partition between said inlet and outlet, and means for detachably securing the device to a telephone transmitter.

901,115. METHOD OF SECURING BLADES OF TURBINES, ETC.; John F. Metten, Philadelphia, Pa. App. filed Feb. 11, 1907. The method of securing blades to turbines, which consists of bringing the blades into proximity with their support and then uniting them thereto by electrolytically deposited metal.

901,127. APPARATUS FOR TELEPHONE INSTALLATIONS; Charles A. Simpson, Chicago, Ill. App. filed Dec. 15, 1904. In a telephone installation, the combination with a mounting plate, of sets of arrester springs mounted on each side of said plate opposite one another the opposed sets serving the respective sides of the same telephone line, terminals for the springs to enable the same to be connected in the electric circuits, auxiliary terminals on each side of the said plate, and exposed cross-connecting conductors leading from said auxiliary terminals to springs of the opposite set.

901,159. CONDUIT-THREADER; John C. Dieter, Anderson, and Samuel Bowsher, Indianapolis, Ind., and Enzley Davis, Toledo, Ohio. App. filed March 11, 1907. A mechanical device having two parts which have a relative longitudinal movement and which alternately engage the walls of the conduit so as to be impelled therethrough.

901,171. ELECTRIC BURGLAR ALARM; Simon B. Hess, New York, N. Y. App. filed May 27, 1907. Has a motor operating to limit the time of operation of the signal, means for releasing said motor upon the instantaneous breaking of the protecting circuit, and means including an electromagnet for stopping said motor at will.

901,189. MOTOR-CONTROLLING APPARATUS; Michael Charles Regan, of the United States Army. App. filed Feb. 4, 1908. A device for controlling motors at a distance. Relates to magnetic means for positioning the controller arm.

901,207. LIGHTNING ARRESTER; Jacob B. Struble, Wilkinsburg, Pa. App. filed Dec. 10, 1906. Has an insulating case and suitable arrester elements arranged in the case, terminals one of which is adjustable through the walls of the case and adapted to electrically contact with the arrester elements and hold the latter in operative relation with each other.

901,212. TELEPHONE HOOK-SWITCH; Henry Tideman, Menominee, Mich. App. filed July 6, 1907. In a telephone hook-switch, a base, a lug upon said base, a pivoted hook lever upon said lug, an adjusting screw threaded into said base, a compression spring between said adjusting screw and said lever, and locking means for said adjusting screw.

901,213. TELEPHONE HOOK-SWITCH; Henry Tideman Menominee, Mich. App. filed July 6, 1907. In a telephone hook-switch, a base having a vertical lug, a pivot screw in said lug, a lock nut for said pivot screw having a section of reduced diameter in that portion of the lock nut adjacent to said lug, a hook lever, and a hook lever tension spring, said tension spring being supported and retained by and upon said lock nut in its portion of reduced diameter.

901,214. TELEPHONE HOOK-SWITCH; Henry Tideman, Menominee, Mich. App. filed July 6, 1907. In a telephone hook-switch, a base part, a switch group mounted upon said base part by a shouldered screw, said shouldered screw being threaded into a lug upon said base part and projecting through said lug, a shouldered threaded lock nut for said screw, and a hook lever adapted to be held by said lock nut and adapted to operate said switch group, said tension spring being adapted to engage and acuate said hook lever.

901,215. TELEPHONE-RINGER; Henry Tideman, Menominee, Mich. App. filed July 6, 1907. In a telephone-ringer, a core drilled and threaded internally at its armature end, a core head for said core having a shank screw-threaded to engage the internal threads of said core, the shank of said core head being axially drilled and longitudinally slotted, and means located within said shank for separating said shank whereby an increased friction of the screw threads of said shank with the internal screw threads of said core may be attained.

901,216. TELEPHONE RINGER; Henry Tideman, Menominee, Mich. App. filed July 6, 1907. In a telephone ringer, a frame comprising two parallel permanent magnets joined by two magnetic yokes, the cores and helices of the ringer being mounted within said frame and carried by one of said magnetic yokes, and the armature being pivoted upon the other of said magnetic yokes, said magnetic yokes being adjustable with relation to each other, said yokes being homologous in body and end portions and each having ears upon the median portion. the ears of one yoke being adapted to receive mounting screws for attaching the ringer, and the ears of the other yoke being adapted to support the armature of the ringer.

901,243. AUTOMATIC FIRE-ALARM TRIP; Frank A. Kehl and Armond Frederick Wright, Tacoma, Wash. App. filed Nov. 30, 1907. A trip device for tripping a fire alarm and including an apparatus similar to a magnetic door lock.

901,250. CAB SIGNAL SYSTEM; Daniel J. McCarthy, Wilkinsburg, Pa. App. filed May 19, 1908. A cab signaling system adapted to be used independently of or in conjunction with an automatic block signaling system, and which, when used in conjunction with such systems, will give an indication within the cab of a locomotive in advance, and also in the block in which a train is located.

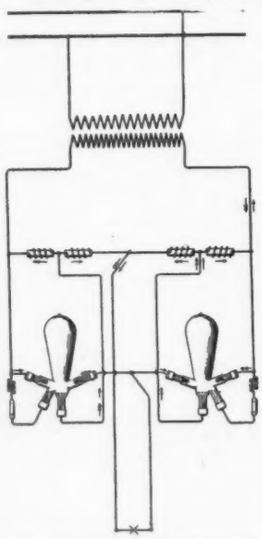
901,261. SAFETY-FUSE; Frank D. Reynolds and Joseph Sachs. Hartford, Conn. App. filed April 17, 1906. A safety fuse comprising a tube having terminals, a fuse strip having a central portion of circular section and adjacent portions of flat section, and a filling material within said tube.

901,269. TELEPHONE RINGER; Henry Tideman, Menominee, Mich. App. filed July 6, 1907. Relates to modifications of the above.

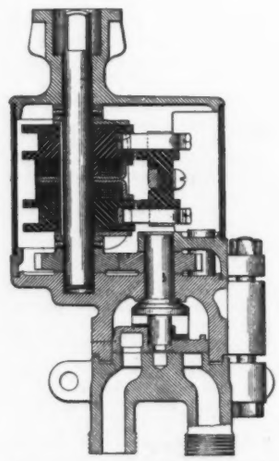
901,280. ELECTROPLATING APPARATUS; John T. Daniels, Newark, N. J. App. filed May 11, 1908. Has a stationary tank containing a normally stationary electrolytic solution, a rotatable container permeable by the solution and detachably suspended therein from above by a single support or bearing, and means to rotate the said container in the solution on an axis at an angle to the level of the surface of the solution.

901,288. ADJUSTABLE SUPPORT FOR VAPOR LAMPS; Stanwood E. Flichtner, Englewood N. J. App. filed Jan. 9, 1905. Includes an inclined frame and a vapor electric lamp supported thereby, and a carriage supporting the frame and means for tilting the frame upon its carriage for starting purposes.

901,294. APPARATUS FOR ELECTRIC LIGHTING; Peter Cooper Hewitt, of New York, N. Y. App. filed May 3, 1902. A vapor lamp



900,745.—System of Electrical Distribution.



900,752.—Controlling Means for Air Brakes.

is made arch-shaped, the lamp being adapted to give a definite spectrum, and a lamp of different spectrum is located within the arch of the first.

901,299. METHOD OF PRODUCING ELECTRIC COILS AND CONDUCTORS THEREFOR; Isidor Kitsee, Philadelphia, Pa. App. filed May 31, 1907. The method of producing conductors for electric coils, which consists in slitting a sheet of conducting material to divide the same into a plurality of strips, and applying a web of insulation to one face of the strips to adapt the same as independent windings.

901,306. SYSTEM OF ELECTRIC DISTRIBUTION; Percy H. Thomas, Pittsburg, Pa. App. filed Jan. 21. 1903. An apparatus to permit the passage of electric currents in a given direction while opposing a material resistance to flow of current in the opposite direction. Has a combination of mercury vapor electrodes in three-phase circuit.